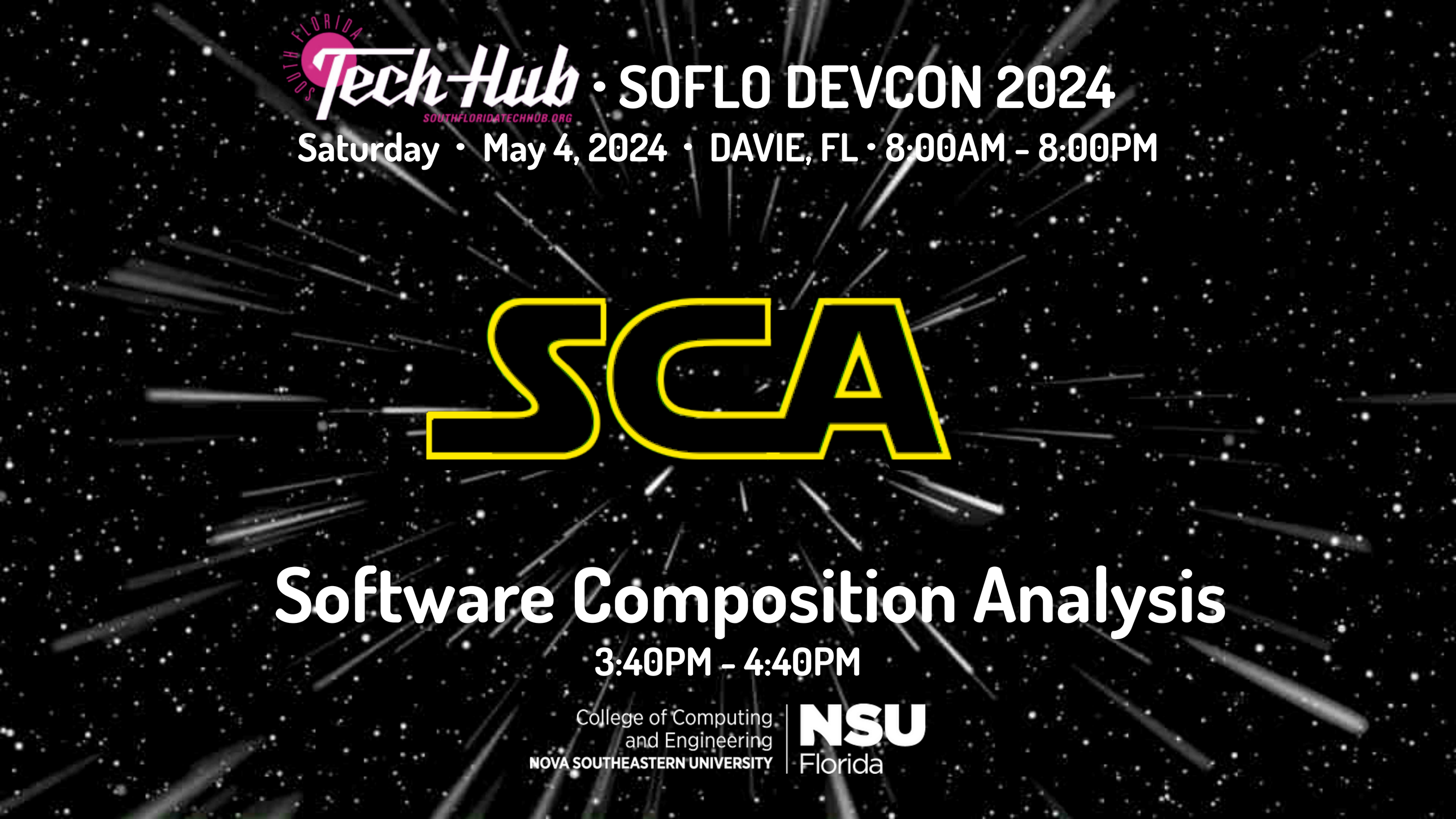
SOUTH FLORIDA
TechHub
SOUTHFLORIDATECHHUB.ORG
· SOFLO DEVCON 2024
Saturday · May 4, 2024 · DAVIE, FL · 8:00AM – 8:00PM
SCA
Software Composition Analysis
3:40PM – 4:40PM
College of Computing and Engineering
NOVA SOUTHEASTERN UNIVERSITY
NSU Florida

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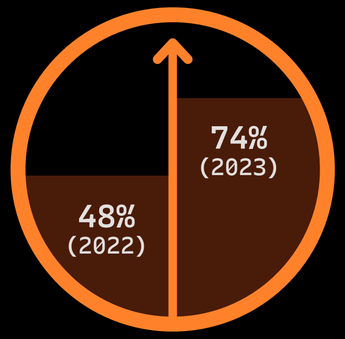
INTRODUCTION

- Market forces are driving companies to develop secure software faster to gain a competitive advantage.
- 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.

OPEN SOURCE EXPOSURE

96%

of the total codebases **contained** open source



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

84%

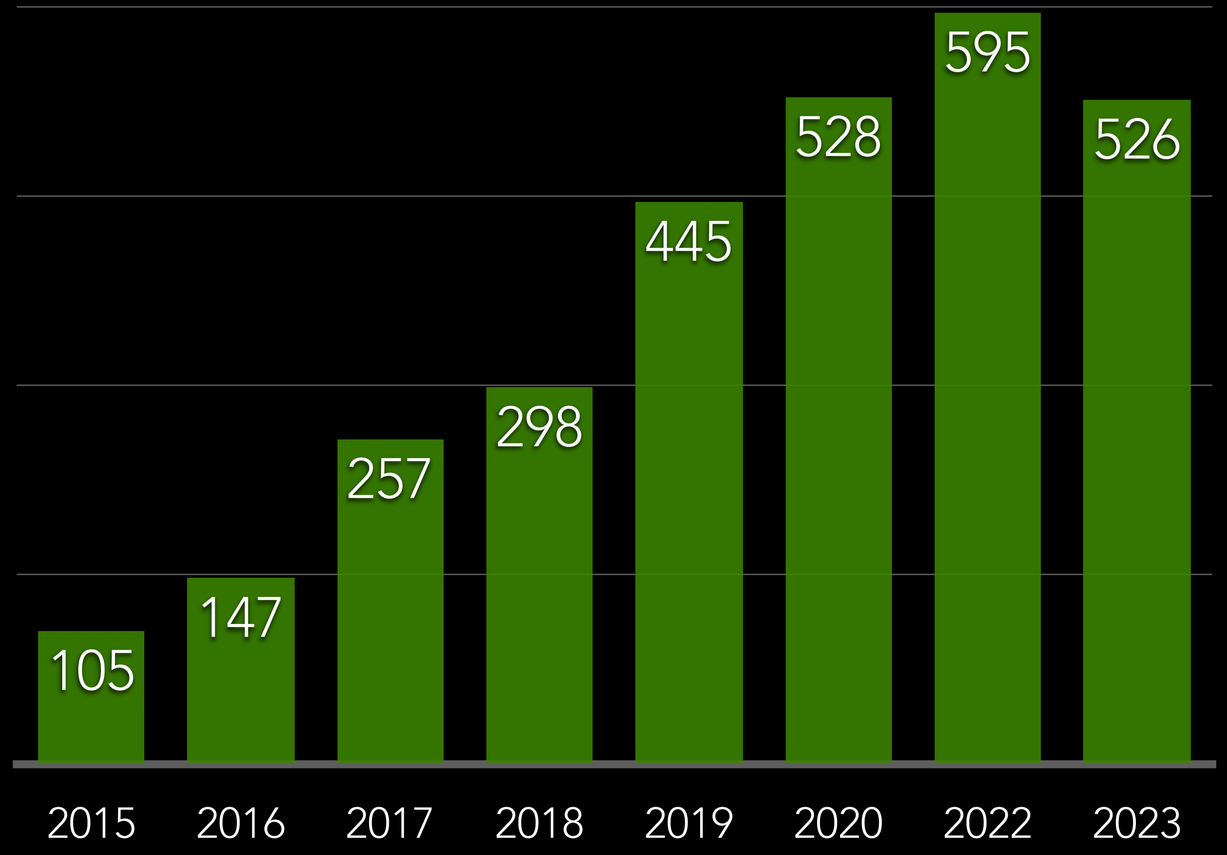
of codebases assessed for risk contained vulnerabilities

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

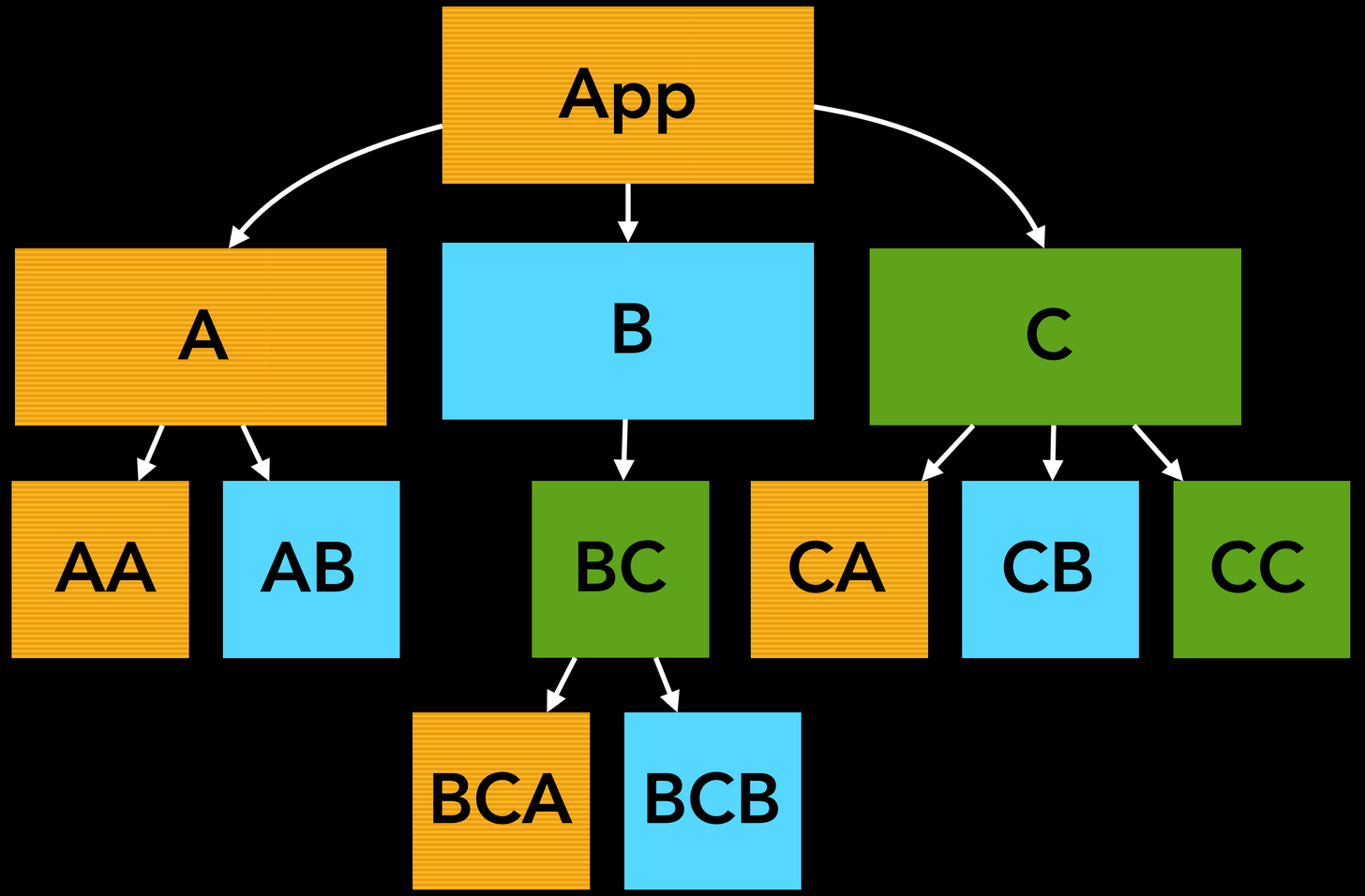
MEDIAN OF 683 FOR JAVASCRIPT APPLICATIONS

(FROM A MEDIAN OF 10 DIRECT)

Source: GitHub Octoverse Report, Dec 2020

TRANSITIVE DEPENDENCIES

"Do you realize how many dependencies?"



"A JEDI USES THE FORCE FOR KNOWLEDGE AND DEFENSE, NEVER FOR ATTACK."

Source: https://www.starwars.com/news/the-starwars-com-10-best-yoda-quotes
https://www.starwars.com/databank/the-force

SECURE CODING TOOL CHEST

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

SCA USE-CASES

- Identify open source components
- Identify security issues in open source components
- Identify license issues in open source components
- Mitigate open-source issues
- Manage open-source quality
- Audits for M&A (Mergers and Acquisitions)
- Monitor vendor software

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 confirmed 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

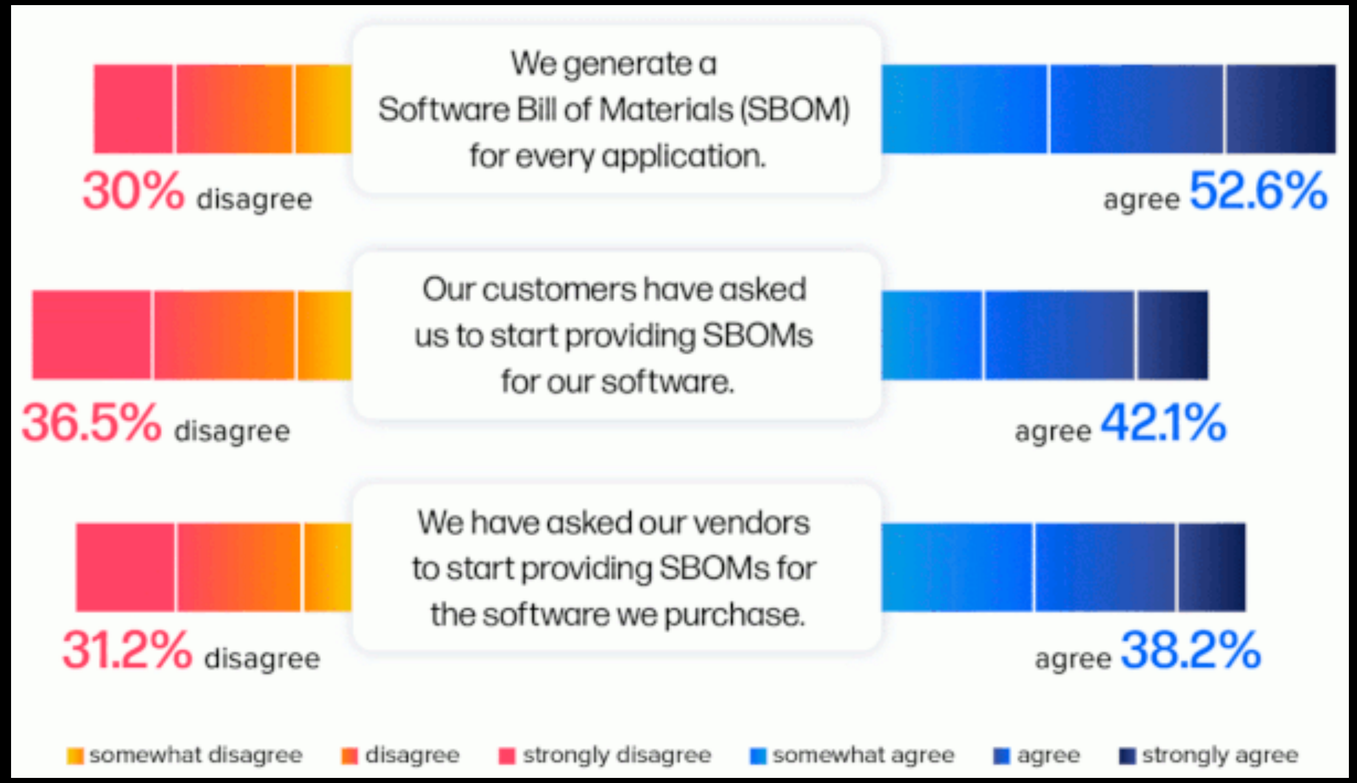
- SPDX® (Software Package Data Exchange)
  - Open standard ISO/IEC 5692:2021 by Linux Foundation

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

EXAMPLE SBOM?

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

SBOM USAGE SURVEY SAYS



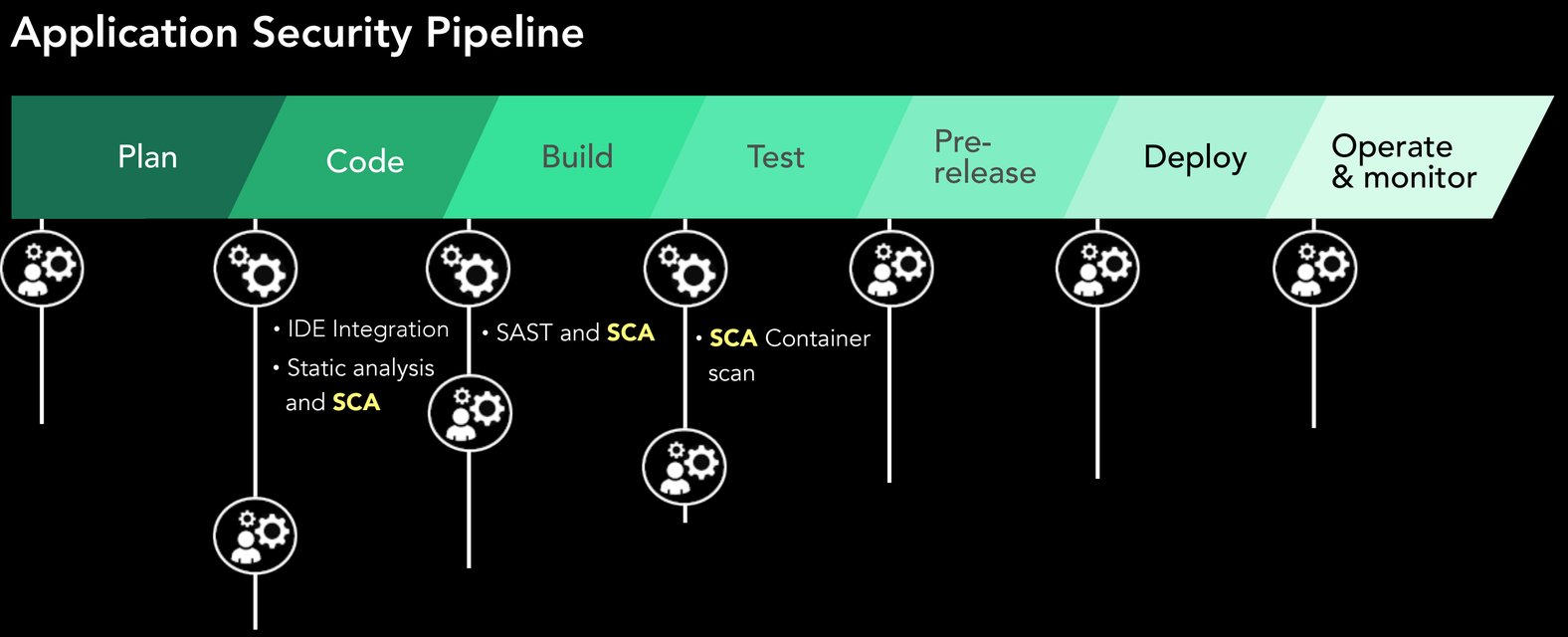
Source: Sonatype 9th Annual State of the Software Supply Chain Report, Nov 2023

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 cost 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

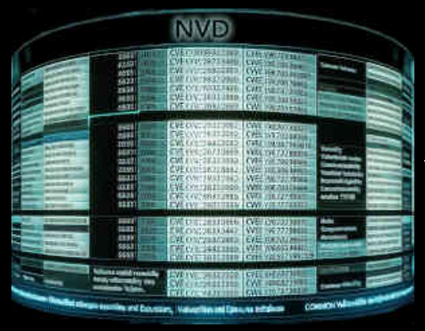
OPEN SOURCE QUALITY MANAGEMENT

"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

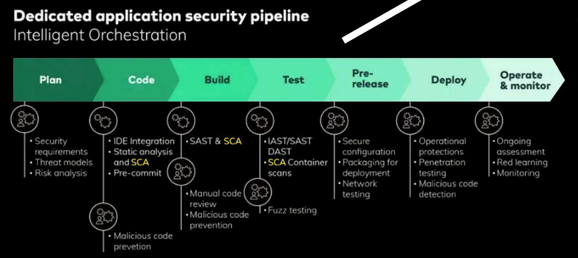


NVD et al.

24/7 Monitoring

SCA SERVICE

SBOM



Pipeline

Email

Text

Microsoft Teams

slack

Jira Software

git GitHub

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

M&A USE-CASE

- Searching for code vulnerabilities
- Searching for licensing conflicts
- Experience
  - Scan and correct before initial engagement
  - Third-party software will be used to audit
  - Do not expect to explain any risk assessment

AI HALLUCINATIONS

The Register

AI hallucinates software packages and devs download them – even if potentially poisoned with malware

Simply look out for libraries imagined by ML and make them real, with actual malicious code. No wait, don't do that

Thomas Claburn — Thu 28 Mar 2024 // 07:01 UTC

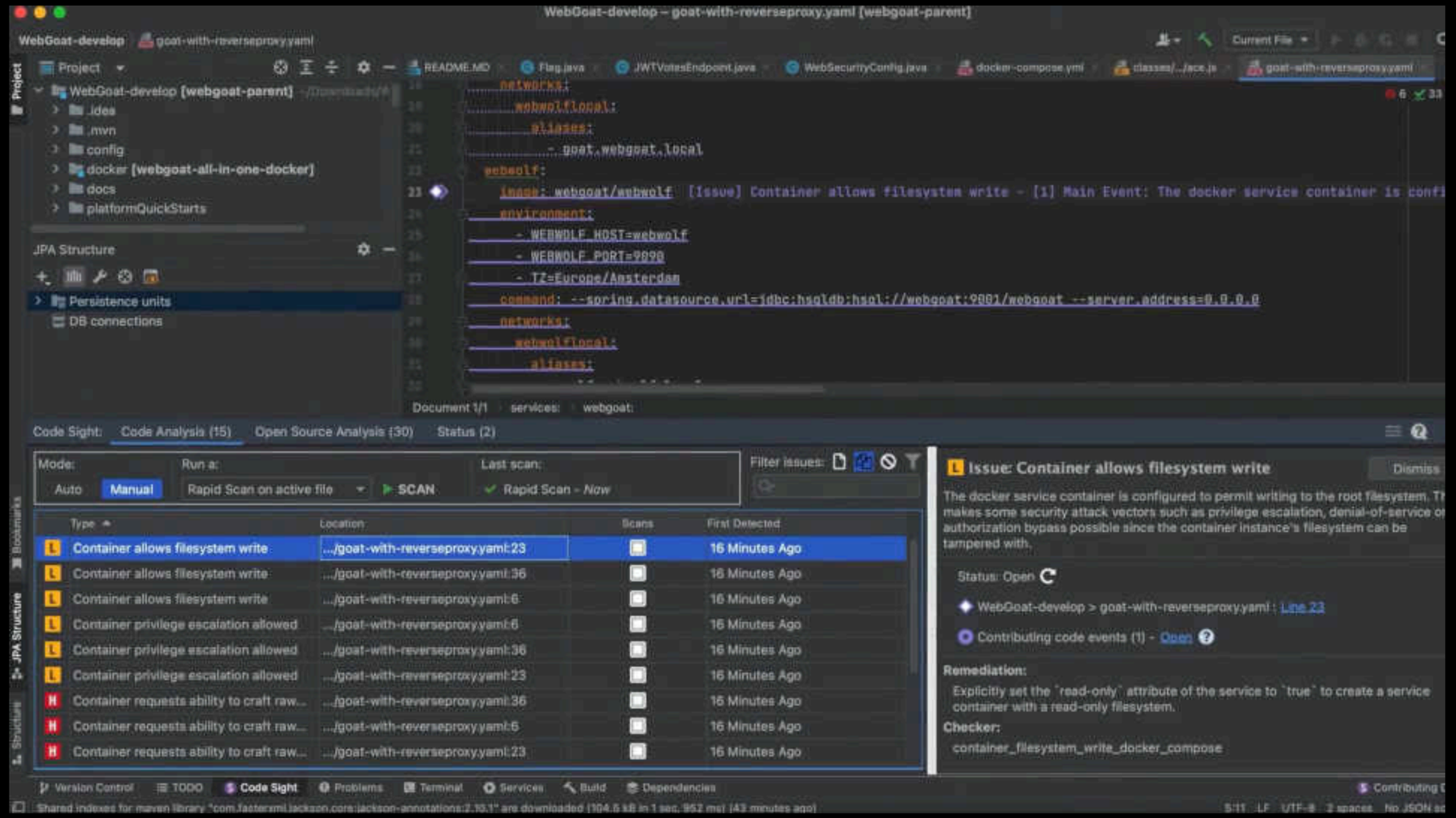
IN-DEPTH Several big businesses have published source code that incorporates a software package previously hallucinated by generative AI.

Not only that but someone, having spotted this reoccurring hallucination, had turned that made-up dependency into a real one, which was subsequently downloaded and installed thousands of times by developers as a result of the AI's bad advice, we've learned. If the package was laced with actual malware, rather than being a benign test, the results could have been disastrous.

Source: https://www.theregister.com/2024/03/28/ai_bots_hallucinate_software_packages/

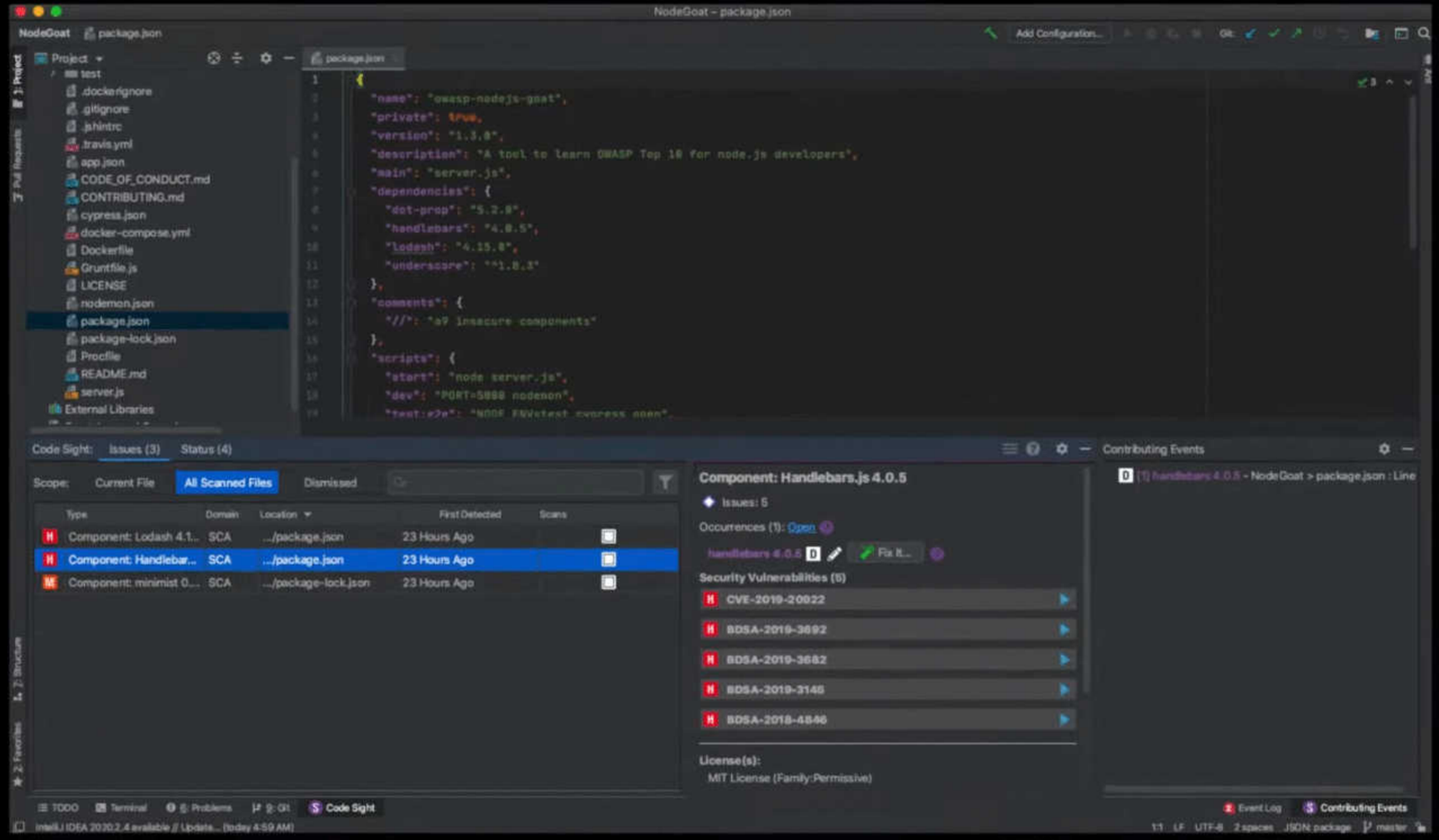
SCA TOOLS

SCA IDE PLUGINS



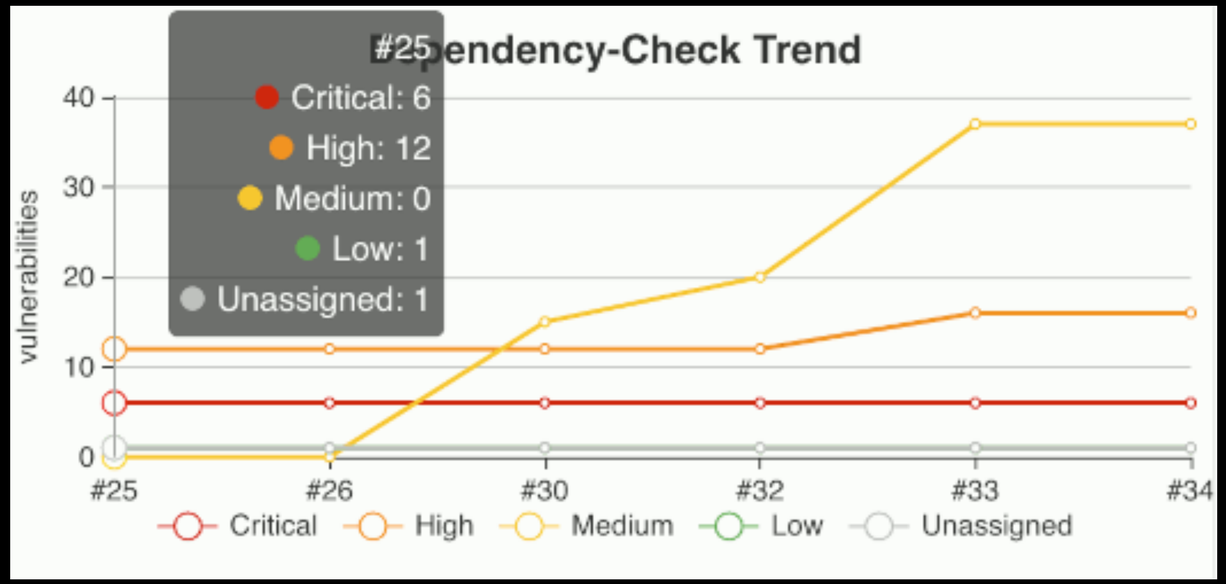
Source: https://youtu.be/6cxi96CJB14

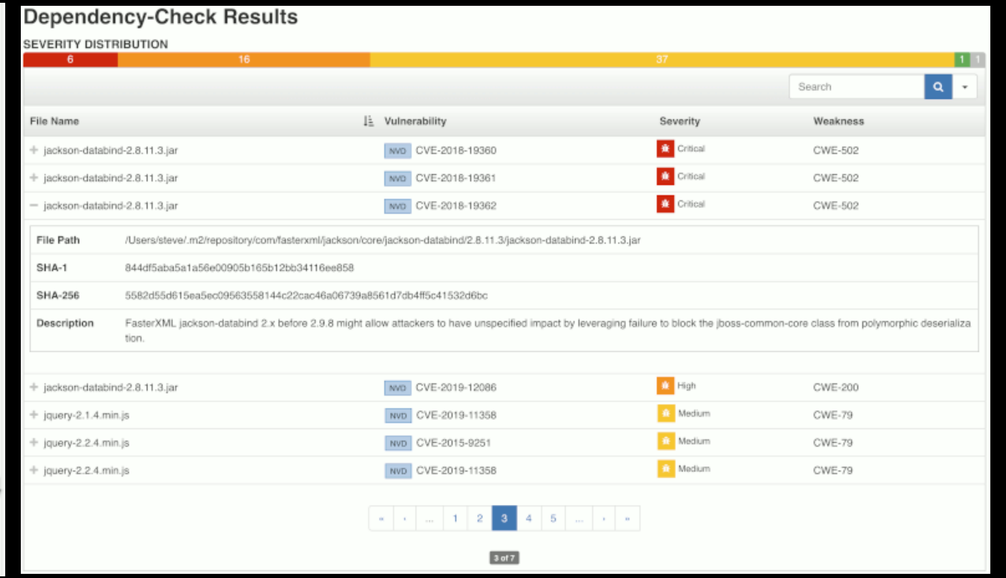
SCA IDE PLUGINS



Source: https://youtu.be/W9BHyXYw3vQ

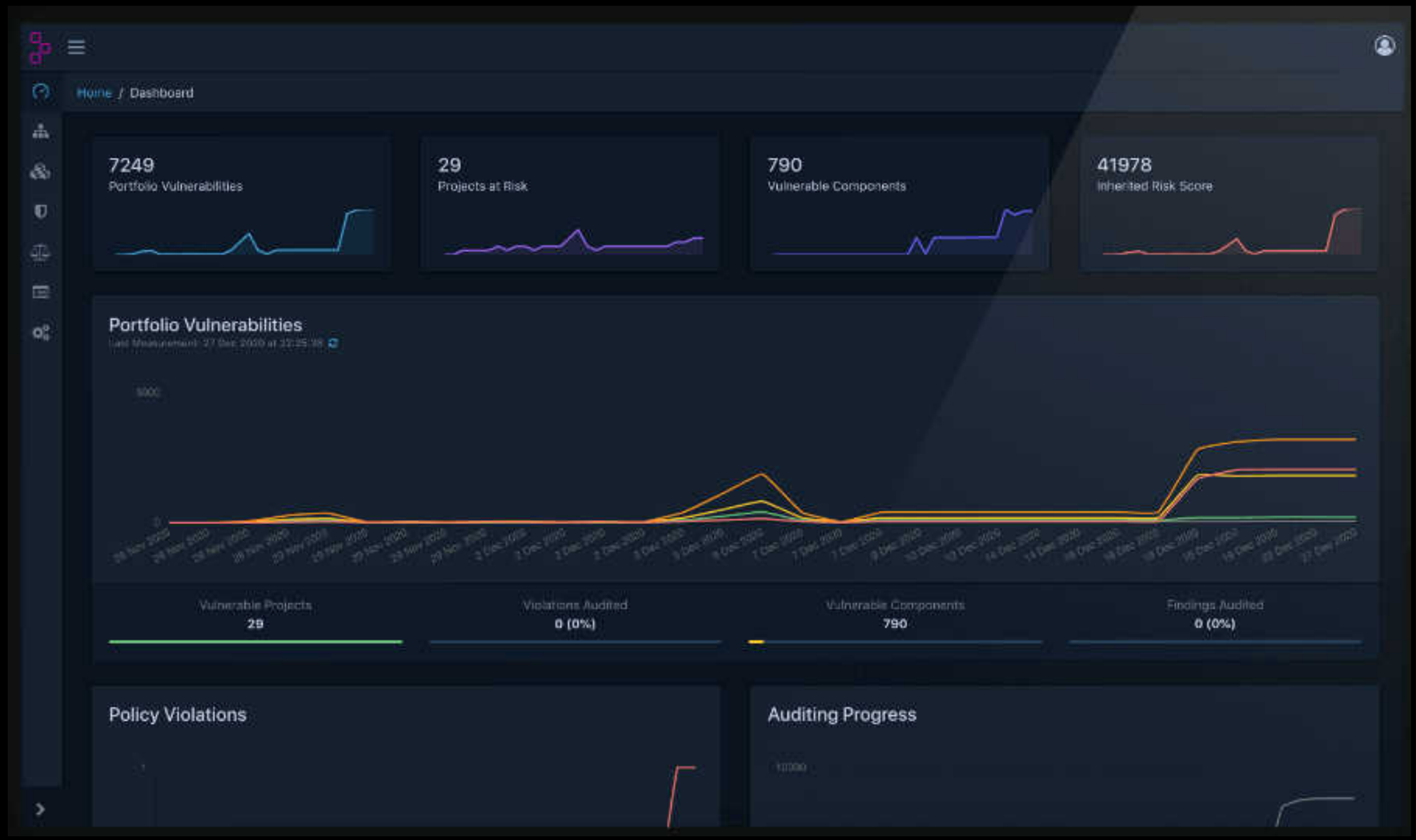
DEPENDENCY CHECK





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

DEPENDENCY TRACK



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

DEPENDENCY TRACK DEMO OVERVIEW

- Step 1: Download application code from GitHub
- Step 2: Create SBOM from project
- Step 3: Upload SBOM to Dependency Track
- Step 4: Observe project's CVEs in Dependence Track

RUNNING DEPENDENCY TRACK

- Step 1: Requirements
  - Windows/Mac/Linux with
    - Memory: Recommend 16 gigabytes
- Step 2: Download/install Docker
- Step 3: Download/install Dependency Track Docker image
  - curl -LO https://dependencytrack.org/docker-compose.yml
  - docker-compose up -d
- Step 4: Download/install git
- Step 5: Download/install npm
- Step 6: Download/install cdxgen
  - npm install -g @cyclonedx/cdxgen

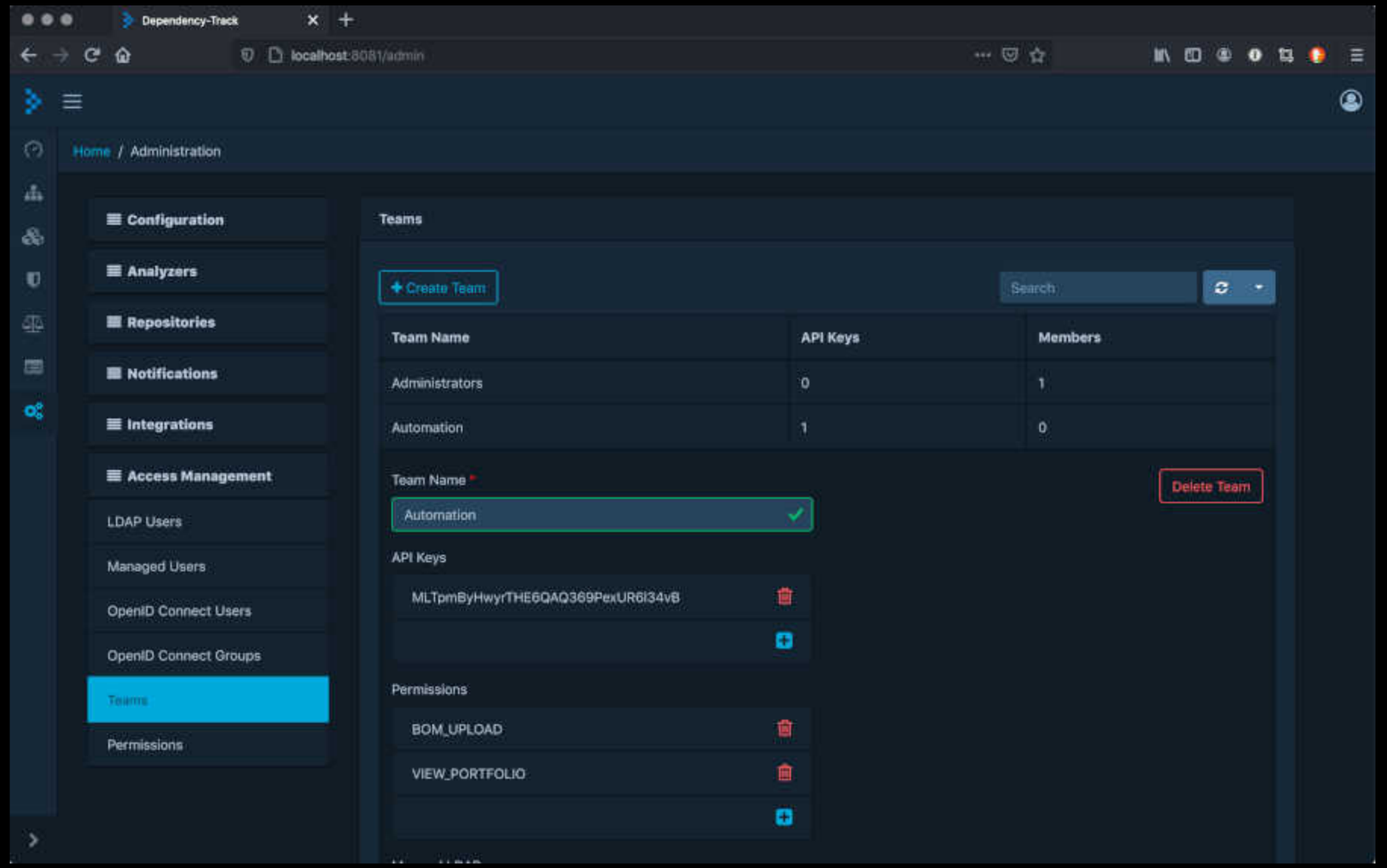
WHAT HAPPENS WHEN DEPENDENCY TRACK IS STARTED THE FIRST TIME

- Downloading the Docker compose file
  - curl -LO https://dependencytrack.org/docker-compose.yml
- Starts Docker container
  - docker-compose up -d
- An embedded H2 database is the default
  - Options: PostgreSQL or Microsoft SQL Server
- Initial startup downloads CVE database
  - Database download takes at least 30 mins.

DEPENDENCY TRACK API SETUP

- Step 1: Login with user/password: admin/admin
  - http://localhost:8080/
  - Default: admin/admin
- Step 2: Dependency Track needs time to download DB (min. 30 mins)
- Step 3: Change admin password
- Step 4: Retrieve API key
  - Home / Administration / Access Management / Teams / Automation
- Note: UI: localhost:8080 / API: localhost:8081

DEPENDENCY TRACK API RETRIEVE API KEY



- Note: Add “PROJECT_CREATION_UPLOAD” permission

CREATING THE SBOM

- Why use cdxgen?
  - Multi-language support:
    - Python, C/C++, Java, JavaScript, Go, Ruby, Rest and more..
- Command line:
  - cdxgen -o bom.json
- Maven plugin (Java maven based projects):
  - mvn cyclonedx:makeAggregateBom

- Chose random Java application
  - git clone https://github.com/neo-nico-neiman/fullstack-booking.git

SENDING SBOM VIA CURL

```
curl -X "POST" "http://localhost:8081/api/v1/bom" ^
-H "Content-Type: multipart/form-data" ^
-H "X-Api-Key: odt_mt3zaRUX48bKPt82IBlQyhzluk7YRknG" ^
-F "autoCreate=true" ^
-F "projectName=fullstack-booking-cdxgen" ^
-F "projectVersion=2.9" ^
-F "bom=@bom.json"
```

* Window batch file example

DEPENDENCY TRACK

DEMO TIME!

South Florida Developer Conference (SoFlo Dev Con)

Thank You

www.linkedin.com/in/ealvarez

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- https://www.dependencytrack.org/

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