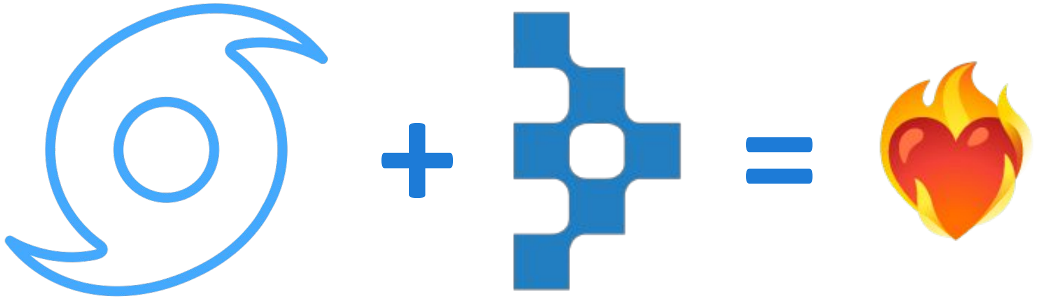
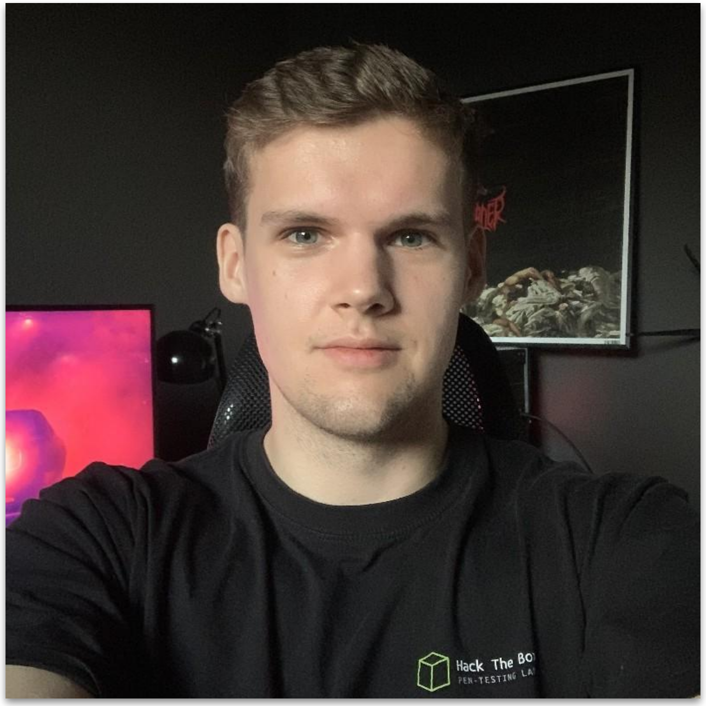


Operationalizing SBOM

With **CycloneDX** and **Dependency-Track**



Niklas Düster

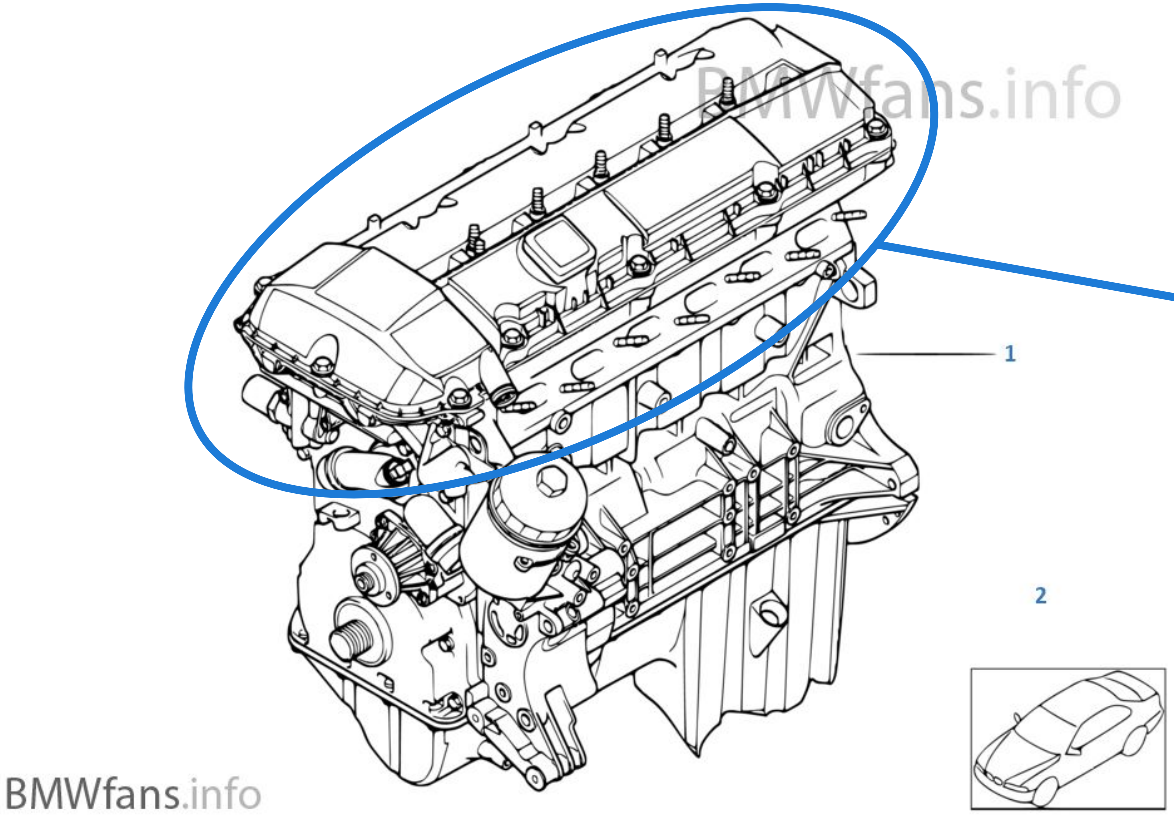
✉ niklas.duester@owasp.org

github.com/nscuro

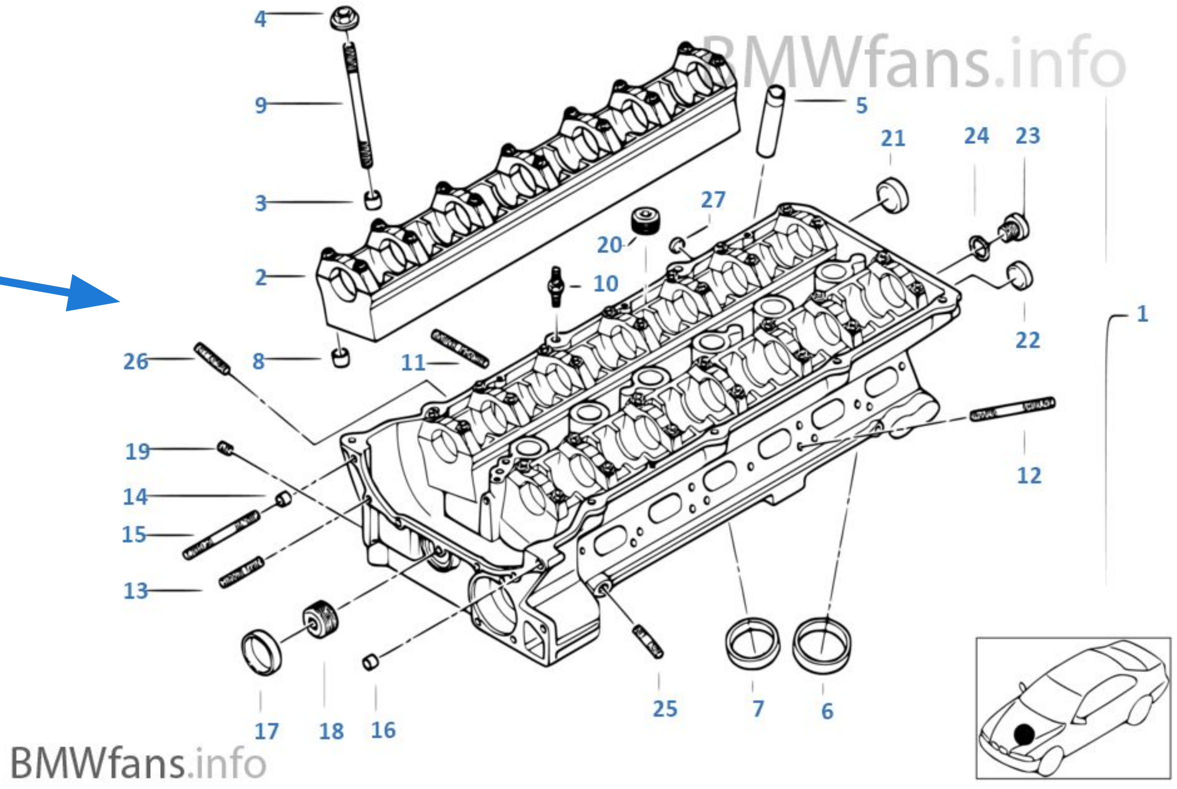
twitter.com/nscur0

- Security Engineer @ PAY/ONE
- OWASP Dependency-Track Project Co-Lead
- OWASP CycloneDX contributor (I maintain the GO stuff)

BOM

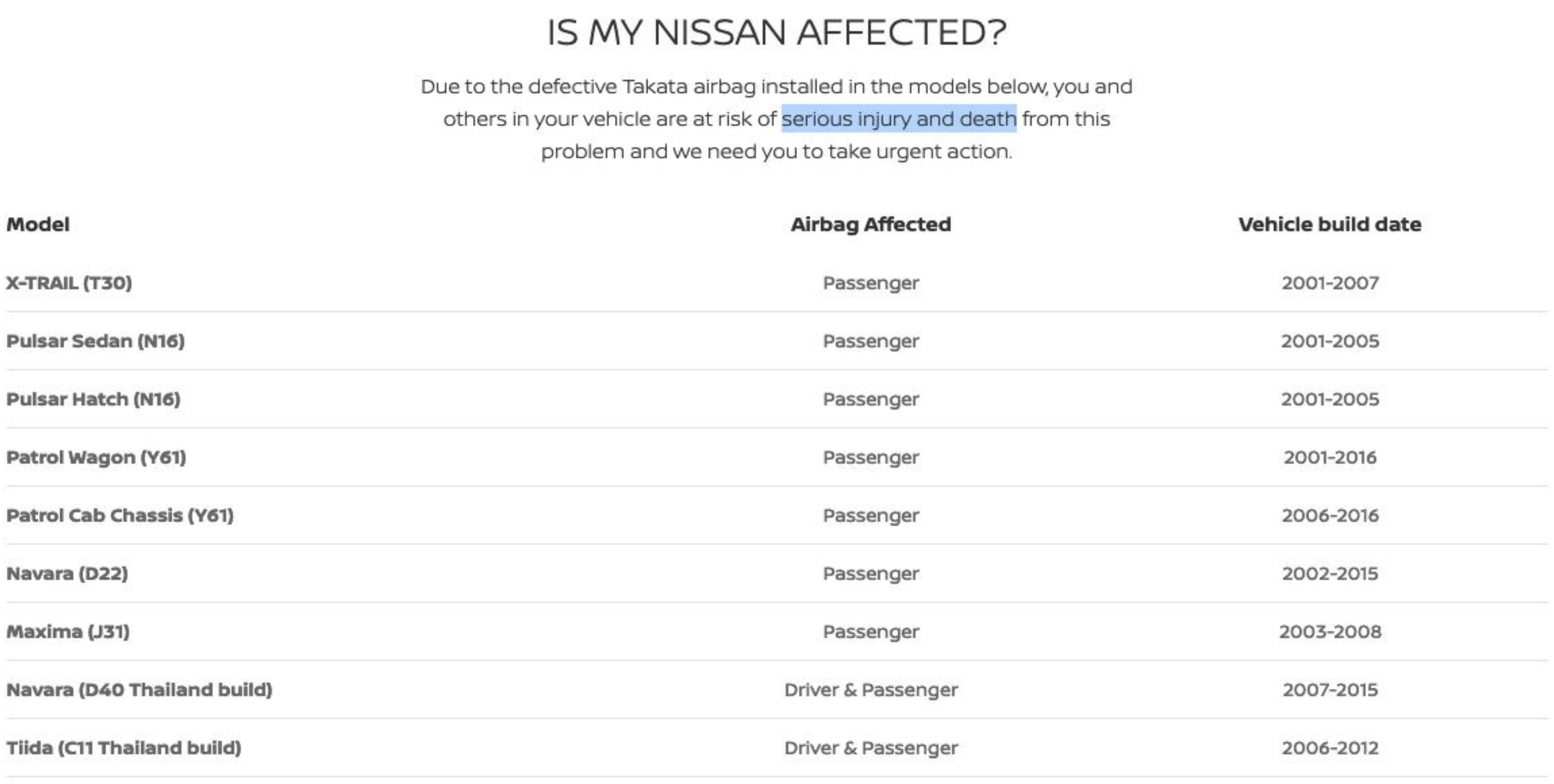


Assembly of the BMW M54 Engine



Sub-assembly of the Cylinder Head

Source: bmwfans.info

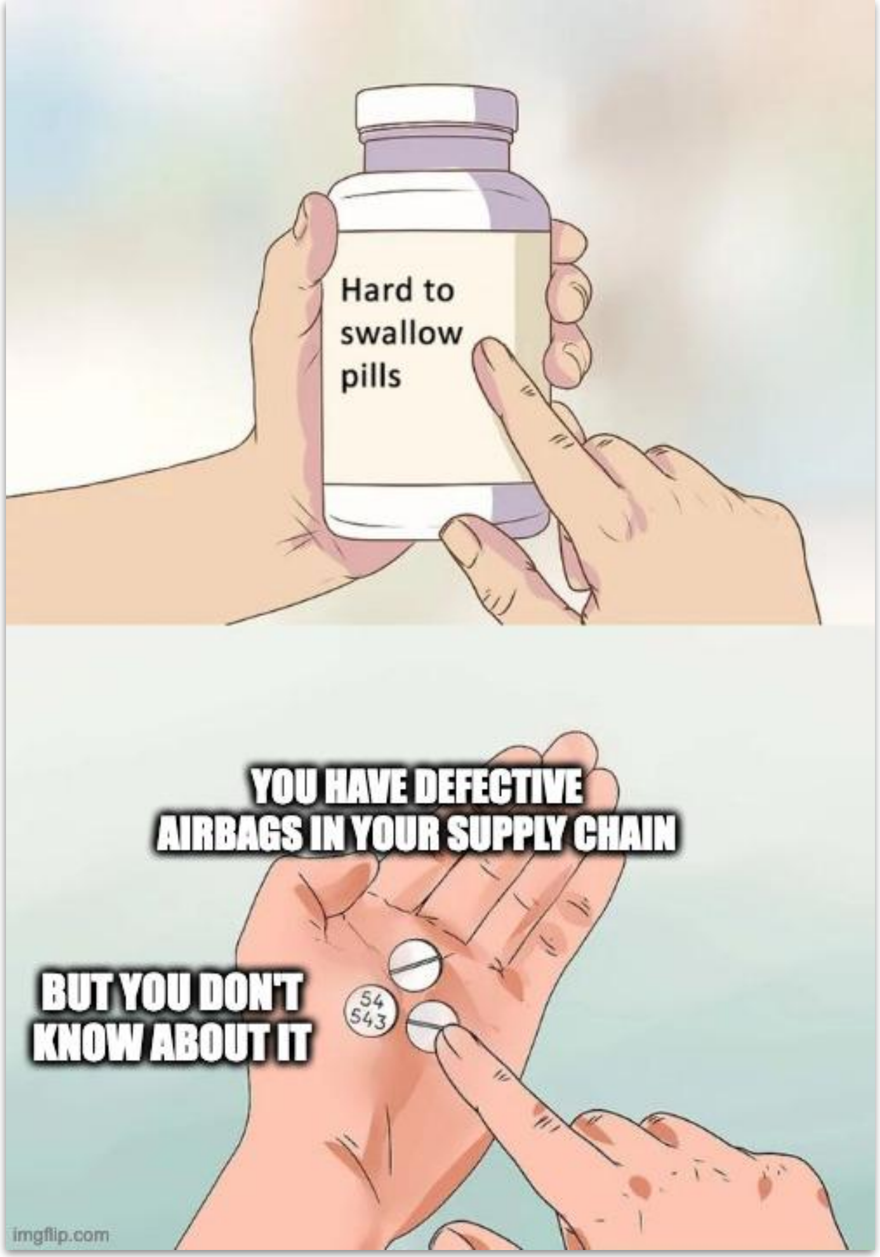


IS MY NISSAN AFFECTED?

Due to the defective Takata airbag installed in the models below, you and others in your vehicle are at risk of serious injury and death from this problem and we need you to take urgent action.

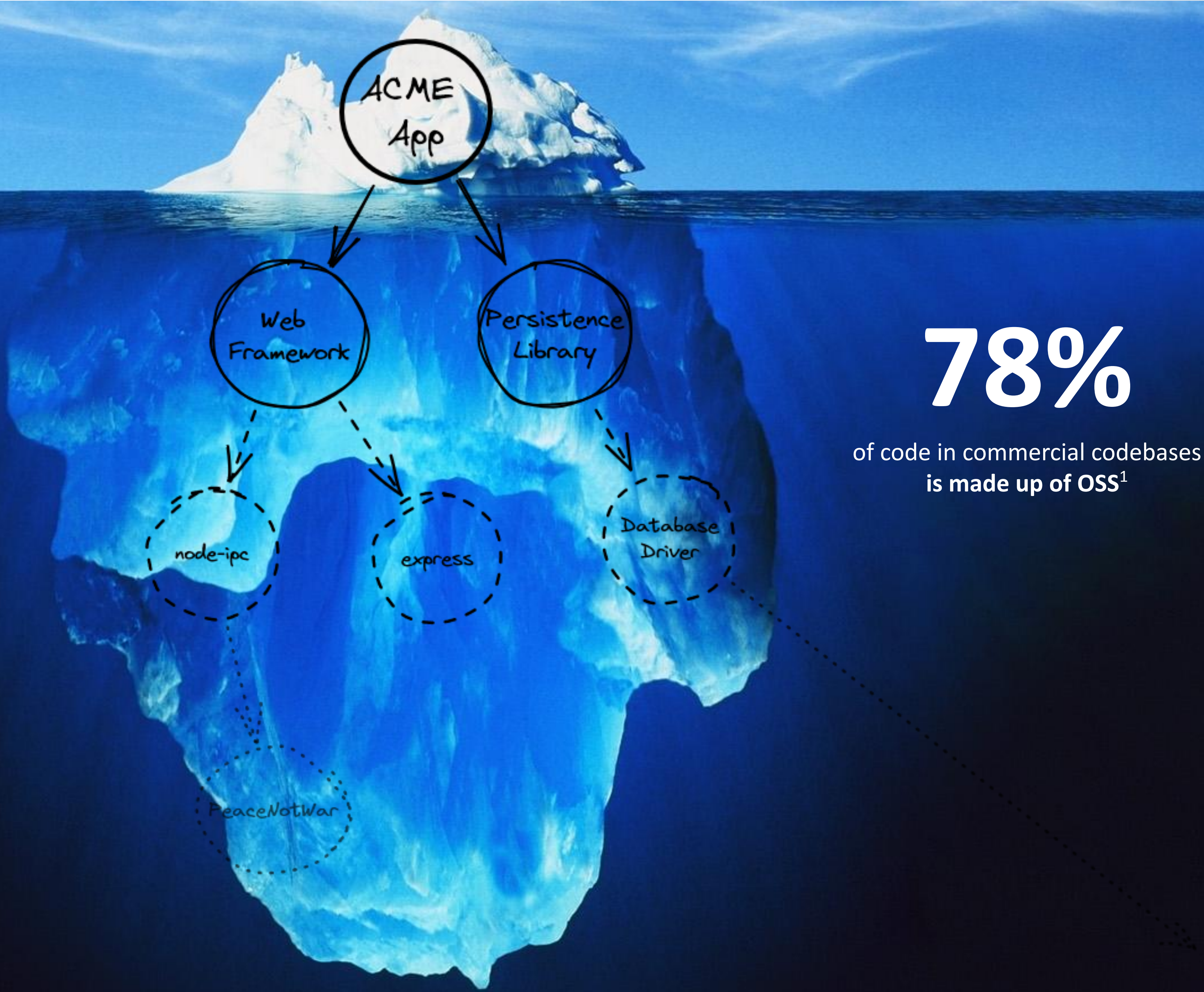
Model	Airbag Affected	Vehicle build date
X-TRAIL (T30)	Passenger	2001-2007
Pulsar Sedan (N16)	Passenger	2001-2005
Pulsar Hatch (N16)	Passenger	2001-2005
Patrol Wagon (Y61)	Passenger	2001-2016
Patrol Cab Chassis (Y61)	Passenger	2006-2016
Navara (D22)	Passenger	2002-2015
Maxima (J31)	Passenger	2003-2008
Navara (D40 Thailand build)	Driver & Passenger	2007-2015
Tiida (C11 Thailand build)	Driver & Passenger	2006-2012

Source: www.nissan.com.au


Hard to swallow pills
YOU HAVE DEFECTIVE AIRBAGS IN YOUR SUPPLY CHAIN
BUT YOU DON'T KNOW ABOUT IT
54 543
imgflip.com

97%

of commercial codebases **contain OSS**[1]

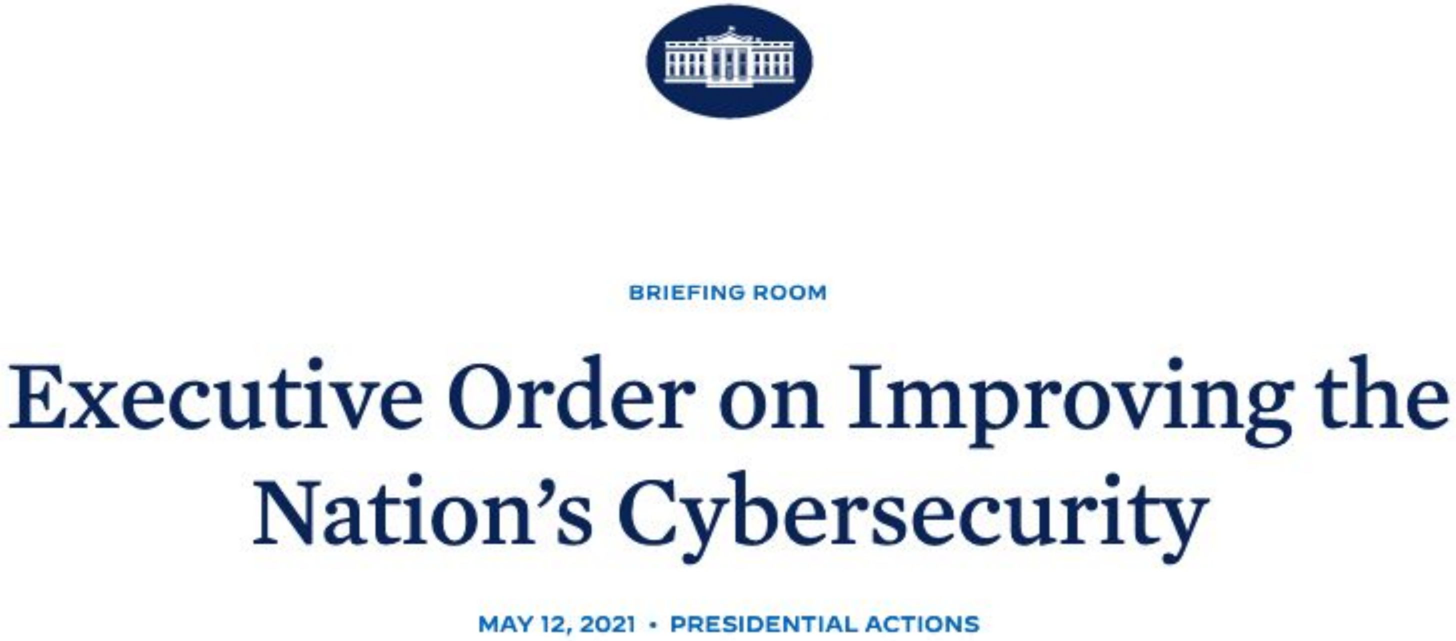


78%

of code in commercial codebases **is made up of OSS**[1]

[1] *Synopsys 2022 Open Source Security and Risk Analysis Report*

SBOM



BRIEFING ROOM

Executive Order on Improving the Nation’s Cybersecurity

MAY 12, 2021 • PRESIDENTIAL ACTIONS

Elements of SBOM

🤏 Bare Minimum[1]

- ✅ Supplier Name
- ✅ Component Name & Version
- ✅ Other Unique Identifiers
- ✅ Dependency Relationships
- ✅ SBOM Author
- ✅ Timestamp

🤔 We probably also want

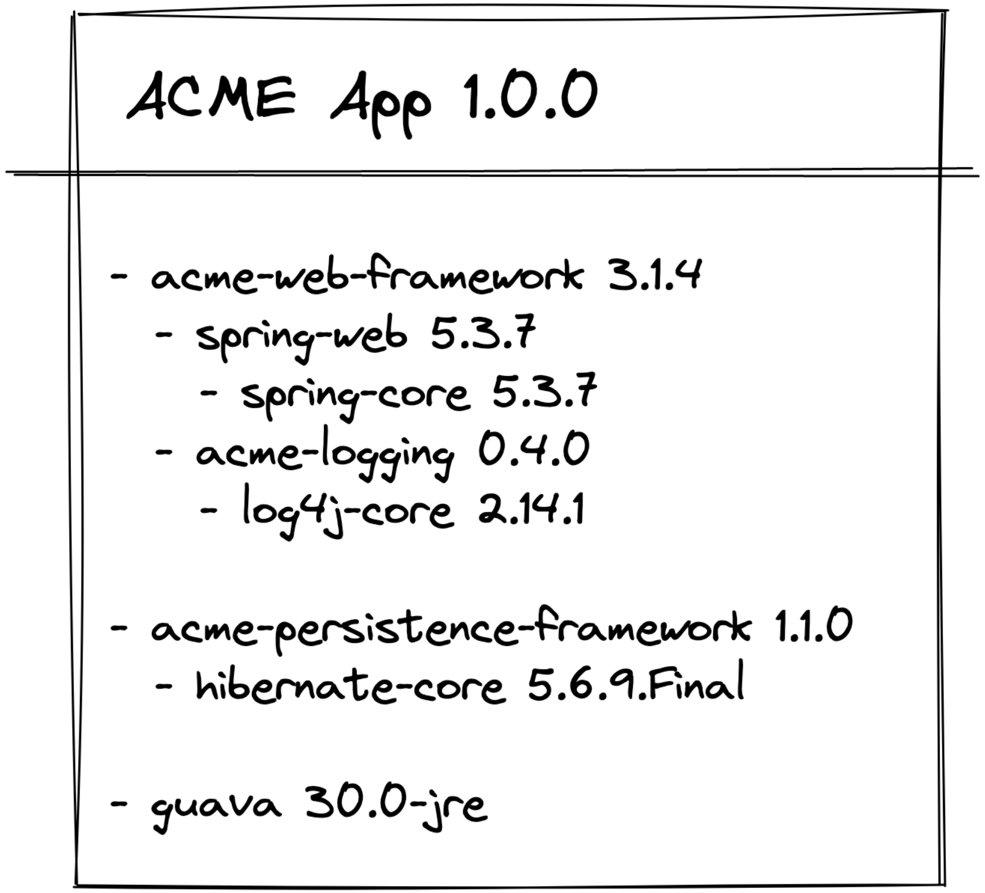
- ☑️ Hashes
- ☑️ Licenses
- ☑️ Provenance
- ☑️ Pedigree
- ☑️ (Much, much more tbh)

[1] ntia.gov/files/ntia/publications/sbom_minimum_elements_report.pdf

This is not an SBOM talk

SBOM SmackDown: Conquer Dragons in the Shadows with OWASP CycloneDX
Steve Springett @ OWASP AppSec USA 2021
youtube.com/watch?v=vNpj6ogou9U

So we share SBOMs now



ACME App 1.0.0

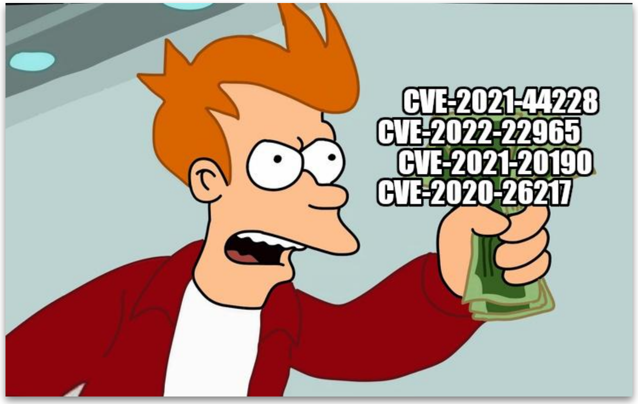
- acme-web-framework 3.1.4
  - spring-web 5.3.7
    - spring-core 5.3.7
  - acme-logging 0.4.0
    - log4j-core 2.14.1

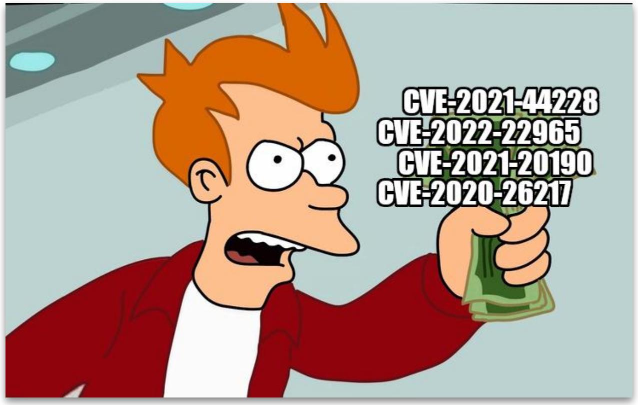
- acme-persistence-framework 1.1.0
  - hibernate-core 5.6.9.Final

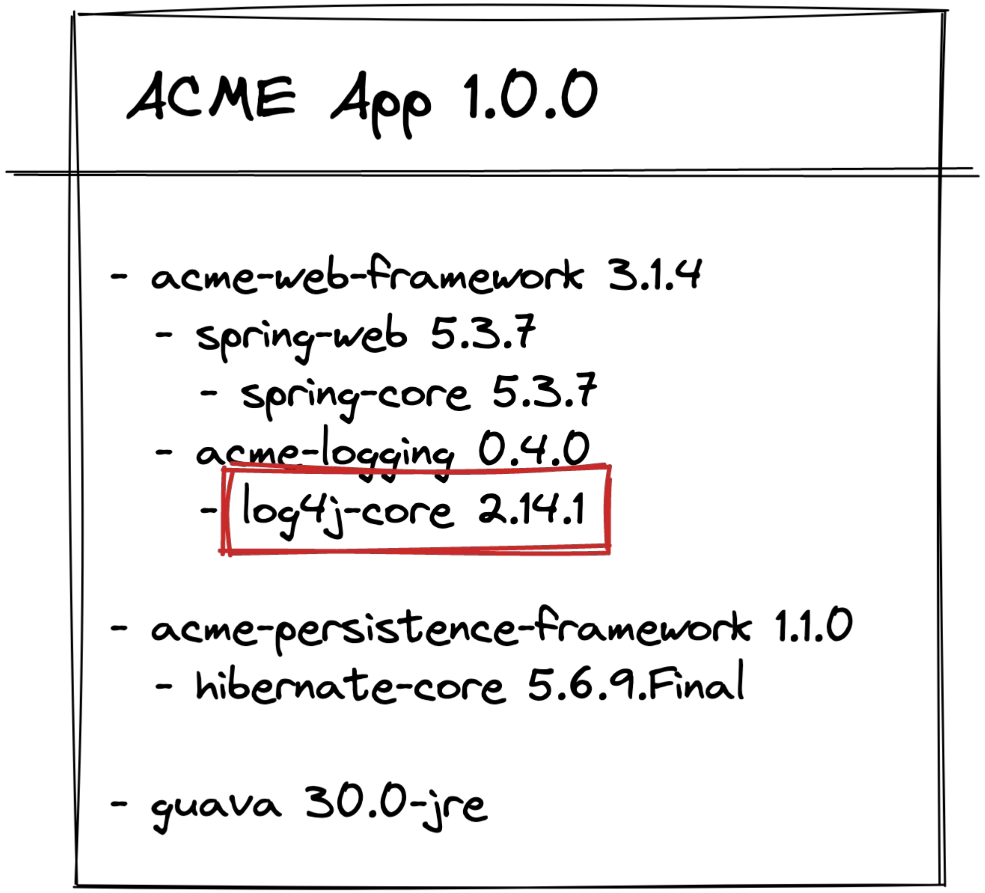
- guava 30.0-jre

SBOM of ACME App

So we share SBOMs now







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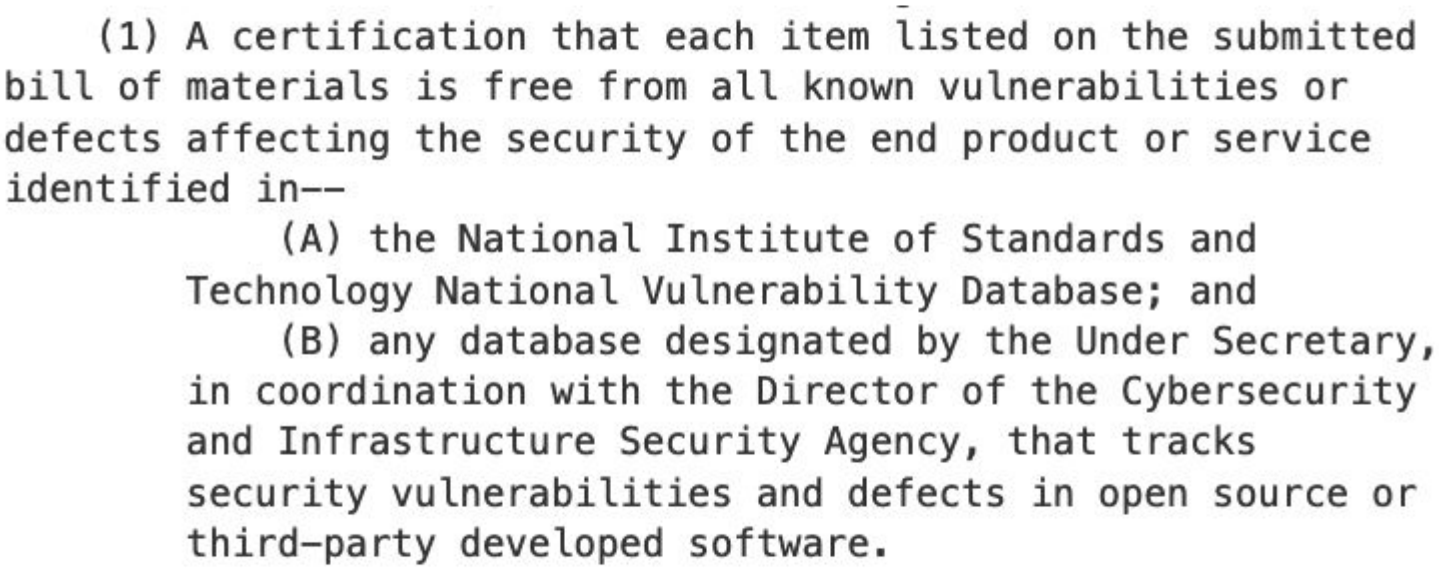
SBOM of ACME App



(1) A certification that each item listed on the submitted bill of materials is free from all known vulnerabilities or defects affecting the security of the end product or service identified in--

(A) the National Institute of Standards and Technology National Vulnerability Database; and

(B) any database designated by the Under Secretary, in coordination with the Director of the Cybersecurity and Infrastructure Security Agency, that tracks security vulnerabilities and defects in open source or third-party developed software.

Source: congress.gov/bill/117th-congress/house-bill/7900

VEX

Minimum Elements of VEX

✅ **Metadata.** *What* is this? *Who* created this and *when*?

✅ **Product Details.** *What product* are we talking about?

✅ **Vulnerability Details.** *Which vulnerability* are we talking about?

✅ **Vulnerability Status.** Is the product *affected*? Do I have to do something about it?

Vulnerability Exploitability eXchange (VEX) – Use Cases

cisa.gov/sites/default/files/publications/VEX_Use_Cases_April2022.pdf

Affected not?

- ☠️ Affected
- 🤞 Not Affected
- ✅ Fixed
- 🚧 Under Investigation

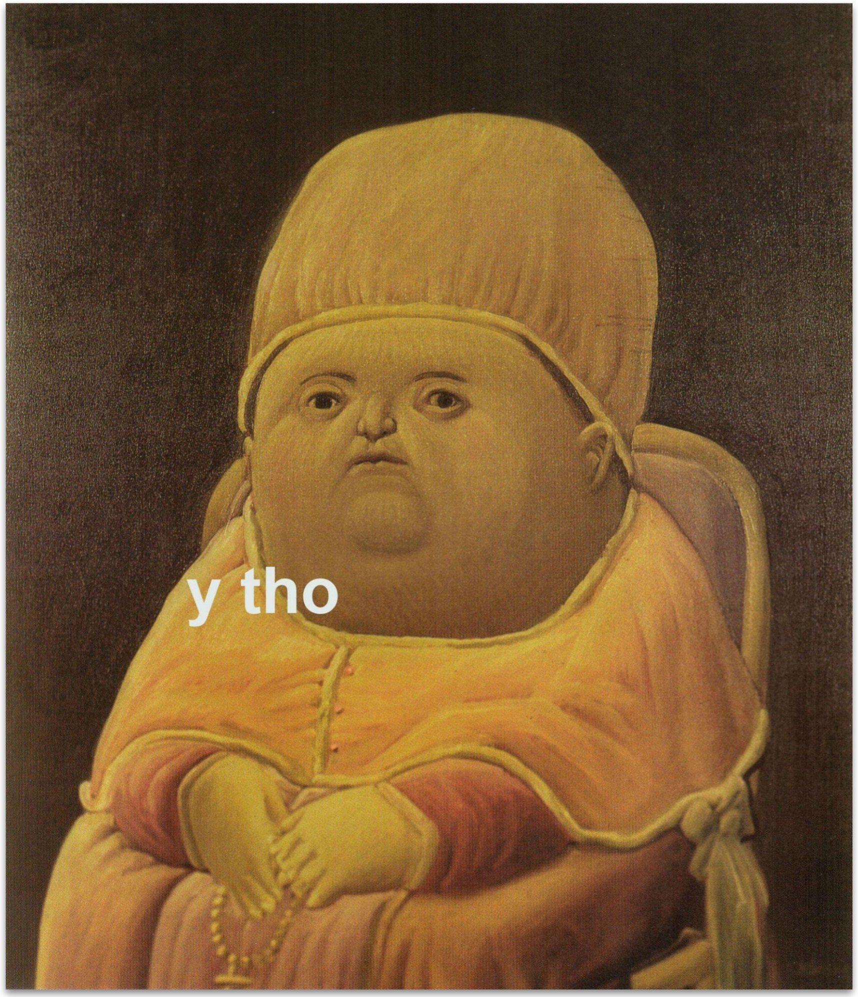
Source: cisa.gov/sites/default/files/publications/VEX_Use_Cases_April2022.pdf

Not affected?

❌ Uhh, uhm, so, I mean, …

❌ Dave said so, but he’s on vacation right now

❌ Just trust me OK, why would I lie?



✅ Component not present

✅ Vulnerable code not present

✅ Vulnerable code not in execution path

✅ Vulnerable code not controllable by adversary

✅ Inline mitigations exist

Source: cisa.gov/sites/default/files/publications/VEX_Status_Justification_Jun22.pdf

CycloneDX

- Bill of Materials Standard for Cybersecurity Use Cases

  ✅ Lightweight: Simplicity > Complexity

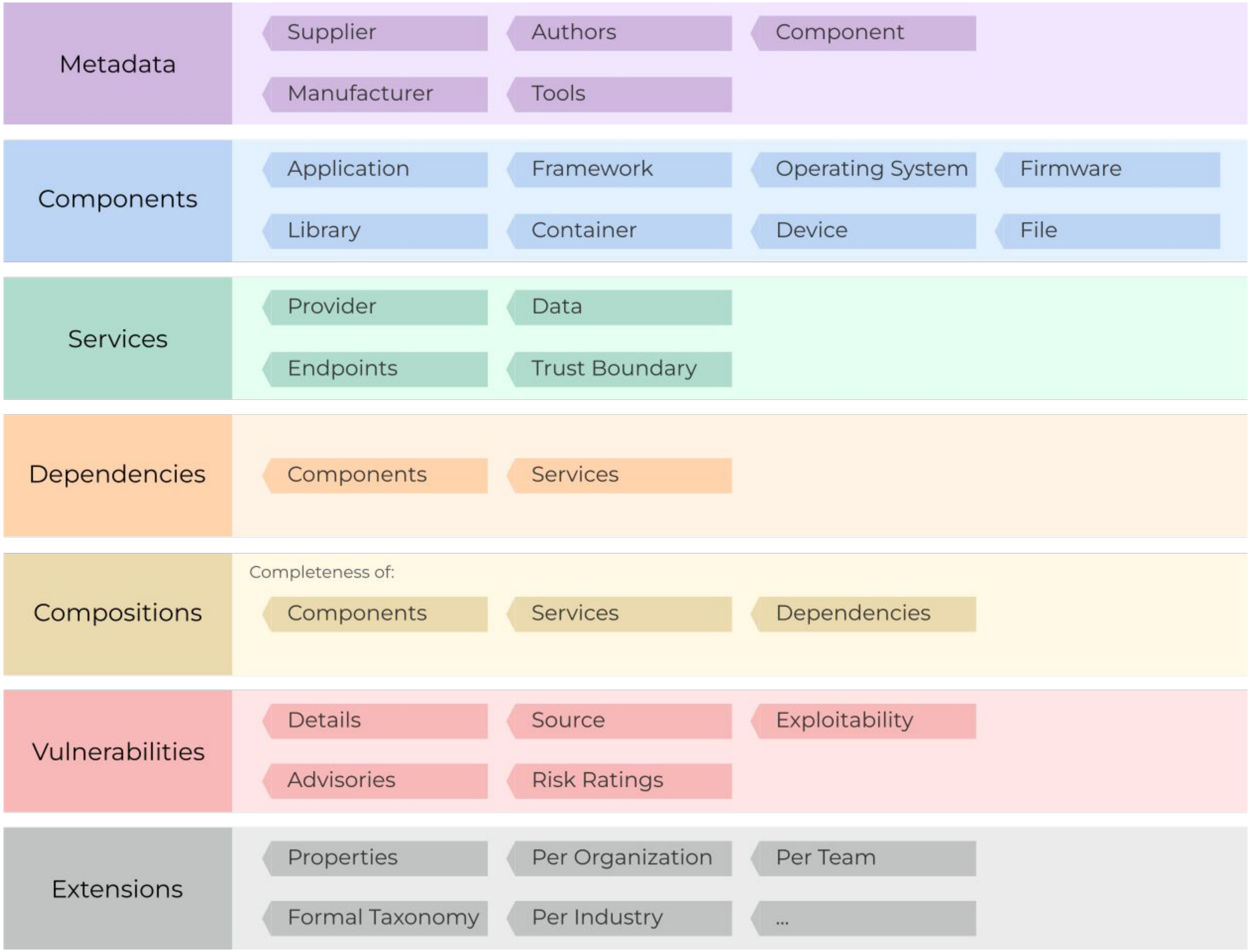
  ✅ Optimized for Automation

- Lead by Steve Springett, Patrick Dwyer, Jeffry Hesse

🚀 OWASP Standards Flagship Project

🚀 Recommended by multiple government orgs worldwide

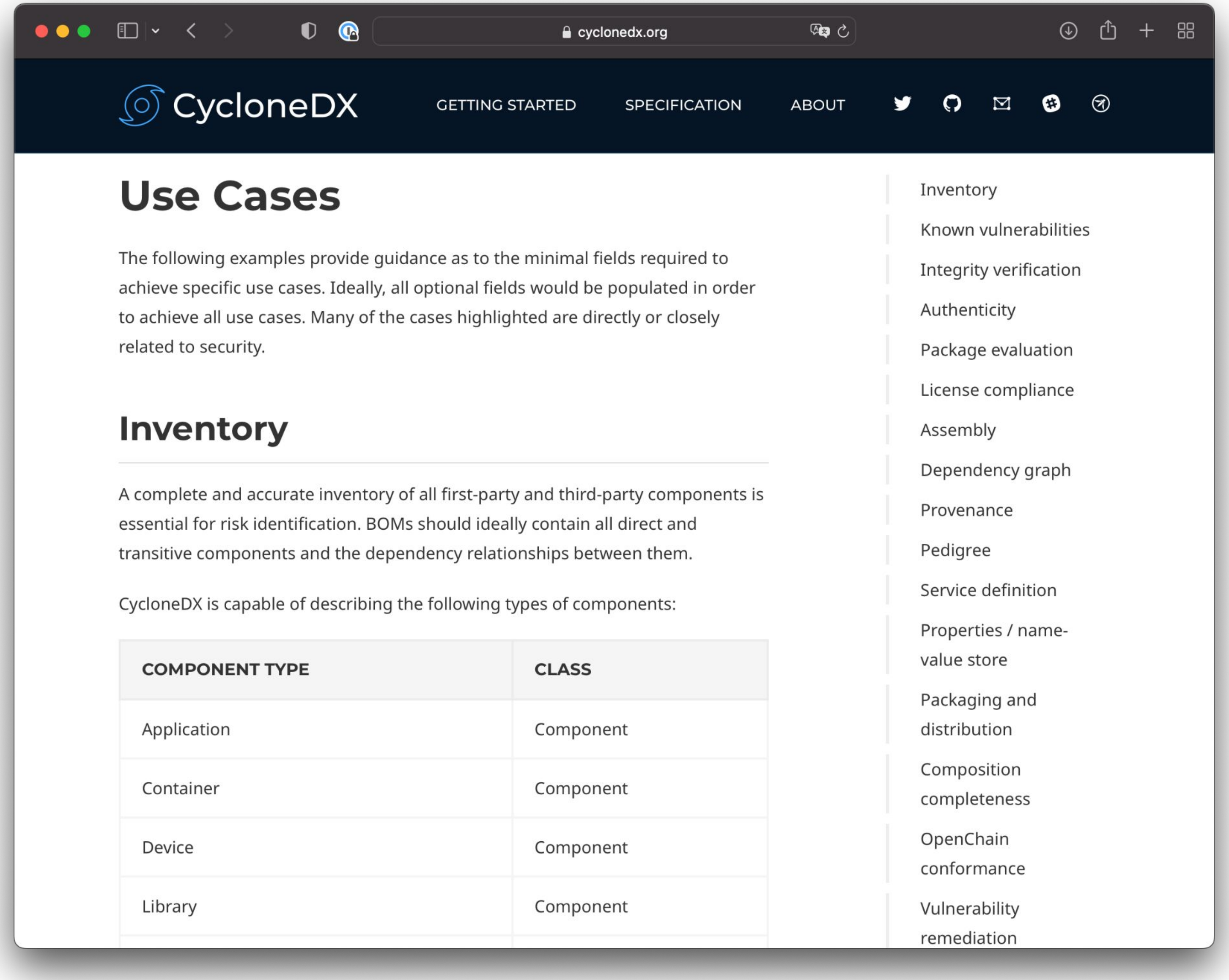
🚀 Used in production at an estimated 100k organizations



Metadata	Supplier	Authors	Component	
	Manufacturer	Tools		
Components	Application	Framework	Operating System	Firmware
	Library	Container	Device	File
Services	Provider	Data		
	Endpoints	Trust Boundary		
Dependencies	Components	Services		
Compositions	Completeness of:			
	Components	Services	Dependencies	
Vulnerabilities	Details	Source	Exploitability	
	Advisories	Risk Ratings		
Extensions	Properties	Per Organization	Per Team	
	Formal Taxonomy	Per Industry	...	

High-level data model of CycloneDX

Source: cyclonedx.org



Use Cases

The following examples provide guidance as to the minimal fields required to achieve specific use cases. Ideally, all optional fields would be populated in order to achieve all use cases. Many of the cases highlighted are directly or closely related to security.

Inventory

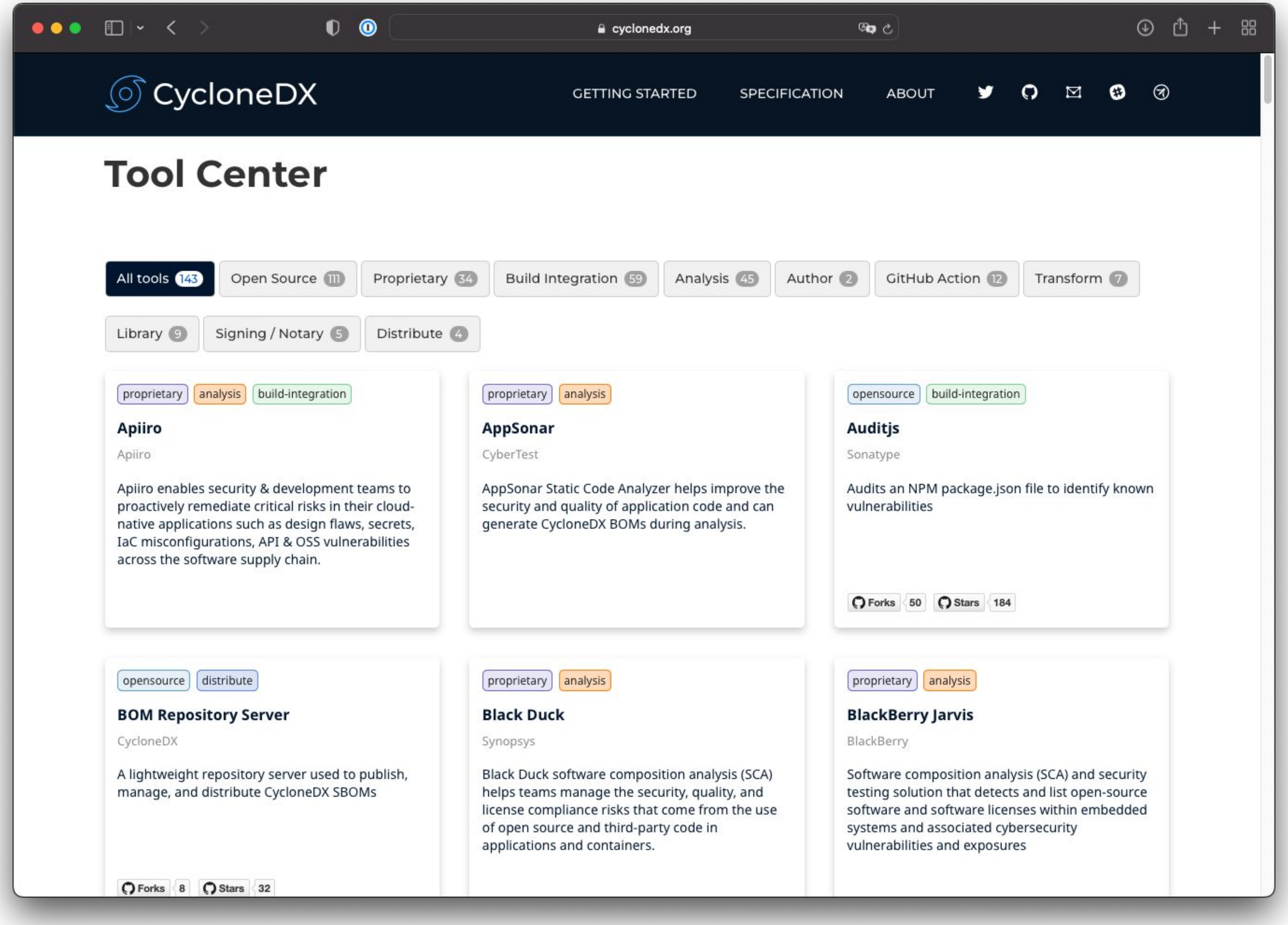
A complete and accurate inventory of all first-party and third-party components is essential for risk identification. BOMs should ideally contain all direct and transitive components and the dependency relationships between them.

CycloneDX is capable of describing the following types of components:

COMPONENT TYPE	CLASS
Application	Component
Container	Component
Device	Component
Library	Component

CycloneDX Use Cases

cyclonedx.org/use-cases/



Tool Center

All tools 143 | Open Source 111 | Proprietary 34 | Build Integration 59 | Analysis 45 | Author 2 | GitHub Action 12 | Transform 7 | Library 9 | Signing / Notary 5 | Distribute 4

proprietary analysis build-integration

Apiiro

Apiiro

Apiiro enables security & development teams to proactively remediate critical risks in their cloud-native applications such as design flaws, secrets, IaC misconfigurations, API & OSS vulnerabilities across the software supply chain.

proprietary analysis

AppSonar

CyberTest

AppSonar Static Code Analyzer helps improve the security and quality of application code and can generate CycloneDX BOMs during analysis.

opensource build-integration

Auditjs

Sonatype

Audits an NPM package.json file to identify known vulnerabilities

Forks 50 Stars 184

opensource distribute

BOM Repository Server

CycloneDX

A lightweight repository server used to publish, manage, and distribute CycloneDX SBOMs

Forks 8 Stars 32

proprietary analysis

Black Duck

Synopsys

Black Duck software composition analysis (SCA) helps teams manage the security, quality, and license compliance risks that come from the use of open source and third-party code in applications and containers.

proprietary analysis

BlackBerry Jarvis

BlackBerry

Software composition analysis (SCA) and security testing solution that detects and list open-source software and software licenses within embedded systems and associated cybersecurity vulnerabilities and exposures

CycloneDX Tool Center

cyclonedx.org/tool-center/

dependency track

- Intelligent Component Analysis Platform
- Ideal for Procurement and ✨DevSecOps✨
- Lead by Steve Springett and yours truly 👈😎👉

🚀 OWASP Tools Flagship Project

🚀 20B Components Analyzed each Month

🚀 >7M Docker Pulls

SBOM Production

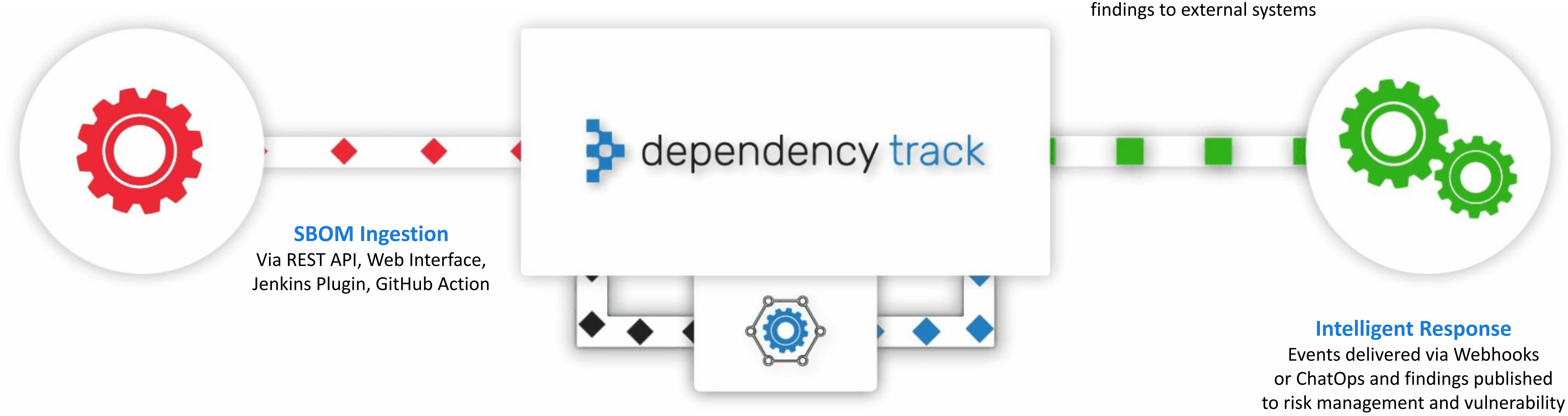
Generated during CI/CD or acquired from suppliers

SBOM Analysis

Component analysis for security, operational, and license risk

Intelligence Streams

Real-time analysis and security events delivering actionable findings to external systems



SBOM Ingestion

Via REST API, Web Interface, Jenkins Plugin, GitHub Action

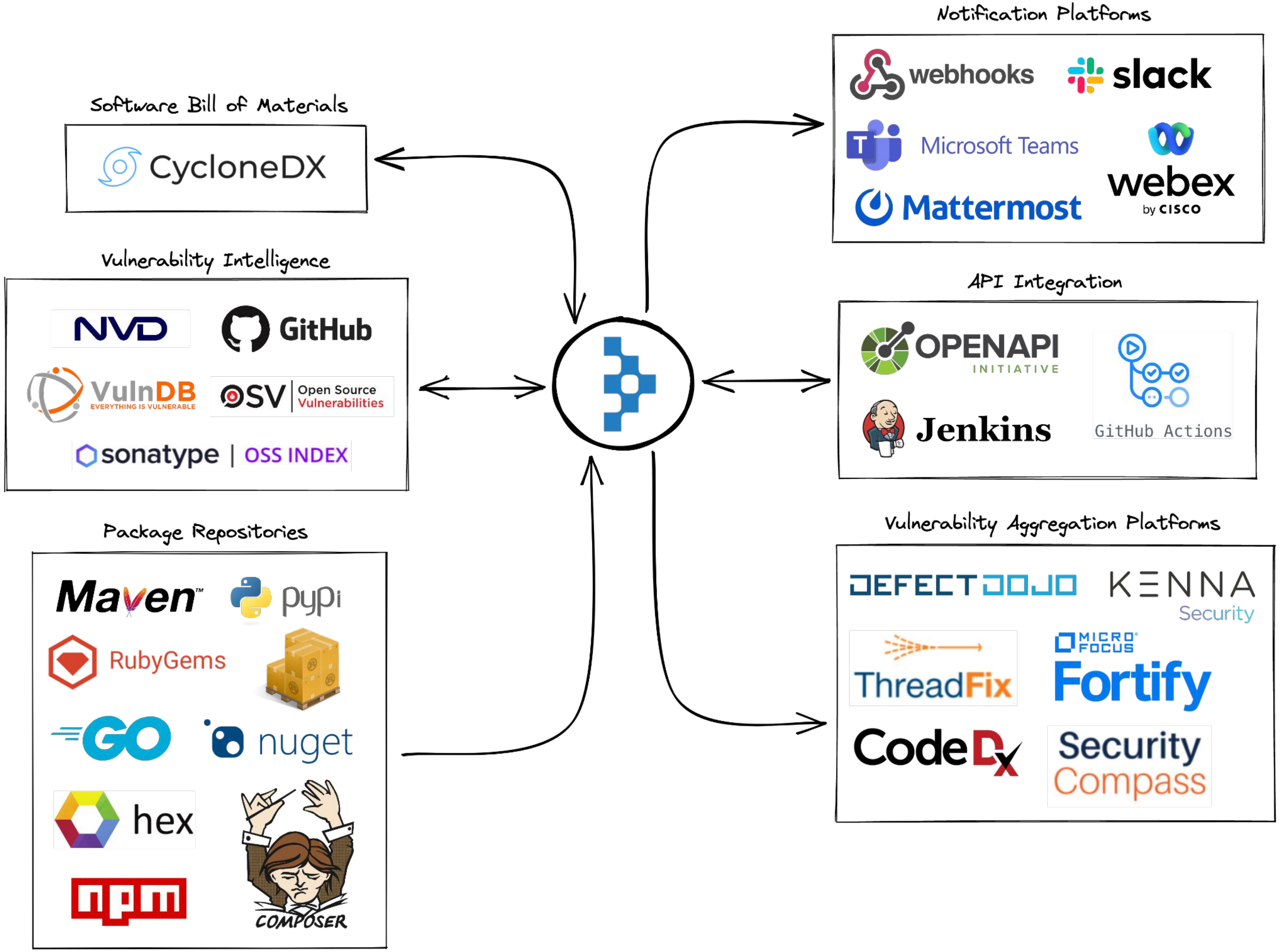
Continuous Monitoring

Continuous analysis of portfolio for risk and policy compliance

Intelligent Response

Events delivered via Webhooks or ChatOps and findings published to risk management and vulnerability aggregation platforms

Demo

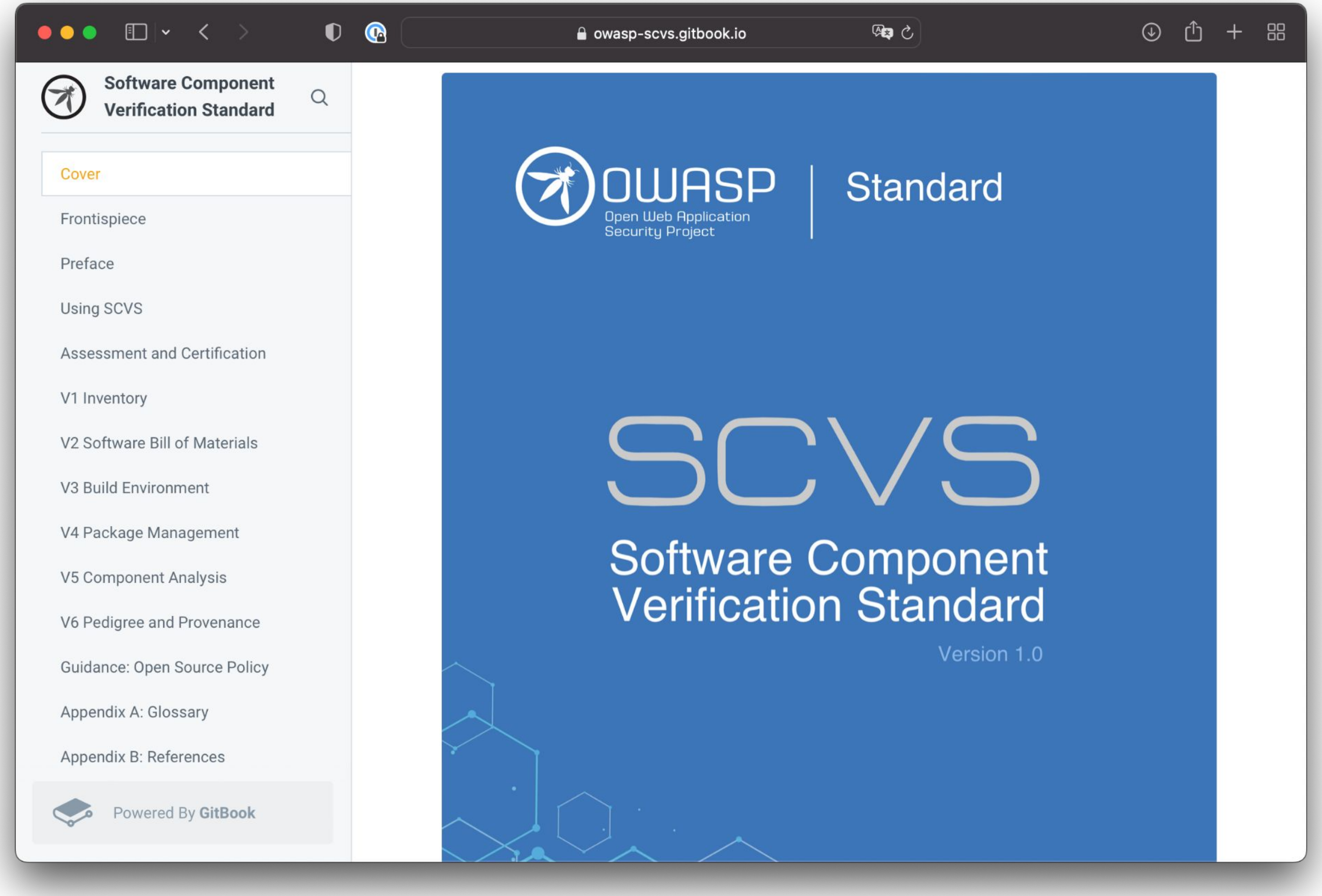

Notification Platforms
webhooks
slack
Microsoft Teams
webex by cisco
Mattermost
Software Bill of Materials
CycloneDX
Vulnerability Intelligence
NVD
GitHub
VulnDB EVERYTHING IS VULNERABLE
OSV Open Source Vulnerabilities
sonatype | OSS INDEX
API Integration
OPENAPI INITIATIVE
GitHub Actions
Jenkins
Package Repositories
Maven
pypi
RubyGems
GO
nuget
hex
npm
COMPOSER
Vulnerability Aggregation Platforms
DEFECTDOJO
KENNA Security
ThreadFix
MICRO FOCUS Fortify
CodeDx
Security Compass

Get Involved!

cyclonedx.org/about/participate/

github.com/DependencyTrack/dependency-track/CONTRIBUTING.md

But wait, there is more!



owasp-scvs.gitbook.io

Software Component Verification Standard

- Cover
- Frontispiece
- Preface
- Using SCVS
- Assessment and Certification
- V1 Inventory
- V2 Software Bill of Materials
- V3 Build Environment
- V4 Package Management
- V5 Component Analysis
- V6 Pedigree and Provenance
- Guidance: Open Source Policy
- Appendix A: Glossary
- Appendix B: References

Powered By GitBook

OWASP Open Web Application Security Project | Standard

SCVS

Software Component Verification Standard

Version 1.0

OWASP Software Component Verification Standard

owasp-scvs.gitbook.io/scvs/

Your turn.

OWASP™