MONTRÉAL JAVA USER GROUP

Who are my roommates?

SBOM to know better your dependencies

$ whoami

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Agenda

- What is a SBOM ?
- SPDX and CycloneDX explained
- Tools to generate SBOM
- Tools to analyze SBOM
- Some formats to exchange vulnerabilities

What is a SBOM ?

Software Bill of Materials

- A list of ingredients that make up software components
- Machine-readable document
- Provide mainly component identifier, hashes, license

➡️ Not to be confused with Maven BOM, which is an indication of versions to use

Usages

- Legal department: license compliance
- Exploitation: current vulnerabilities
- Others: OSS libraries health check, ...

SPDX

Software Package Data eXchange

- Started in 2010, hosted by Linux Foundation
- ISO/IEC 5962:2021
- Made first for license management : https://spdx.dev/ids/
- Open standard for SBOMS

CycloneDX

- Started in 2017, backed by OWASP Foundation
- Last release in January 2022 with version 1.4
- More than SBOM : VEX, HardwareBOM, VDR

SPDX or CycloneDX

- SPDX license list is the reference (~300 entries)
- CycloneDX is more efficient for vulnerability management
- Conversion tools exists (but some information could be lost)

Some identifier types

- Package URL (purl)
  - https://github.com/package-url/purl-spec
  - Maven example: `pkg:maven/group/barfoo@2.14.2`
  - Npm: `pkg:npm/foobar@12.3.1`
- Common Platform Enumeration (CPE)
  - https://nvd.nist.gov/products/cpe
  - Example: `cpe:2.3:a:ntp:ntp:4.2.8:p3:*:*:*:*:*:*`

SPDX/CycloneDX identifiers

- SPDX identifier

```
"name": "jackson-core",
"SPDXID": "SPDXRef-Package-java-archive-jackson-core-3475e1f30056bc6a",
"versionInfo": "2.14.2",
```

with sometimes

```
"externalRefs":[{
  "referenceCategory":"PACKAGE-MANAGER",
  "referenceLocator":"pkg:maven/com.fasterxml.jackson.core/jackson-core@2.14.2",
  "referenceType":"purl"}
  ]}
```

- CyloneDX identifier

```
"bom-ref":"pkg:maven/com.fasterxml.jackson.core/jackson-core@2.14.2
?package-id=3475e1f30056bc6a",
"cpe":"cpe:2.3:a:jackson-core:jackson-core:2.14.2:*:*:*:*:*:*:*",
"group":"com.fasterxml.jackson.core",
"name":"jackson-core",
"purl":"pkg:maven/com.fasterxml.jackson.core/jackson-core@2.14.2",
"type":"library","version":"2.14.2"
```

Tools to generate

- syft: for containers or archives (CycloneDX, SPDX)
  - paketo: use Syft to include sboms in app image
- cdxgen : various supported languages (CycloneDX)
  - Maven or Gradle plugin
- SPDX Maven plugin
- Using GitHub dependency graph (SPDX)
- OpenTelemetry had an idea to create SBOM from traces metadata
- And probably many more!

Some examples

Made from paketo Java samples (spring-boot3 project)

📝 **sample-java.plugin.cdx.json**

```
# Gradle plugin
$ gradle cyclonedxBom
```

📝 **sample-java.plugin+syft.cdx.json**

```
# Enriched with Syft
$ syft packages file:sample-java.plugin.cdx.json -o cyclonedx-json
```

📝 sample-java.paketo.cdx.json

```
# Extracted from paketo layers
$ pack sbom download samples/java --output-dir ./
cd layers/sbom/launch/paketo-buildpacks_executable-jar
```

📝 sample-java.syft.cdx.json

```
# Paketo image analyzed by Syft
$ syft packages docker:samples/java -o cyclonedx-json
```

With some differences

≠ tools

Source	Number of deps
Gradle (project)	58
Syft (Gradle CycloneDX)	58
Paketo (layer)	54
Syft (image)	341

Gradle plugin ≠ Gradle+Syft

+

cpe: `cpe:2.3:a:jackson-core:jackson-core:2.14.2:*:*:*:*:*:*:*"`

properties: syft properties

–

description: pom description

externalReferences: project vsc

group: maven group

hashes: jar hashes

modified: deprecated field

Gradle plugin ≠ Paketo

➕ `spring-boot-starter-*`

➡️ Because in another paketo layer

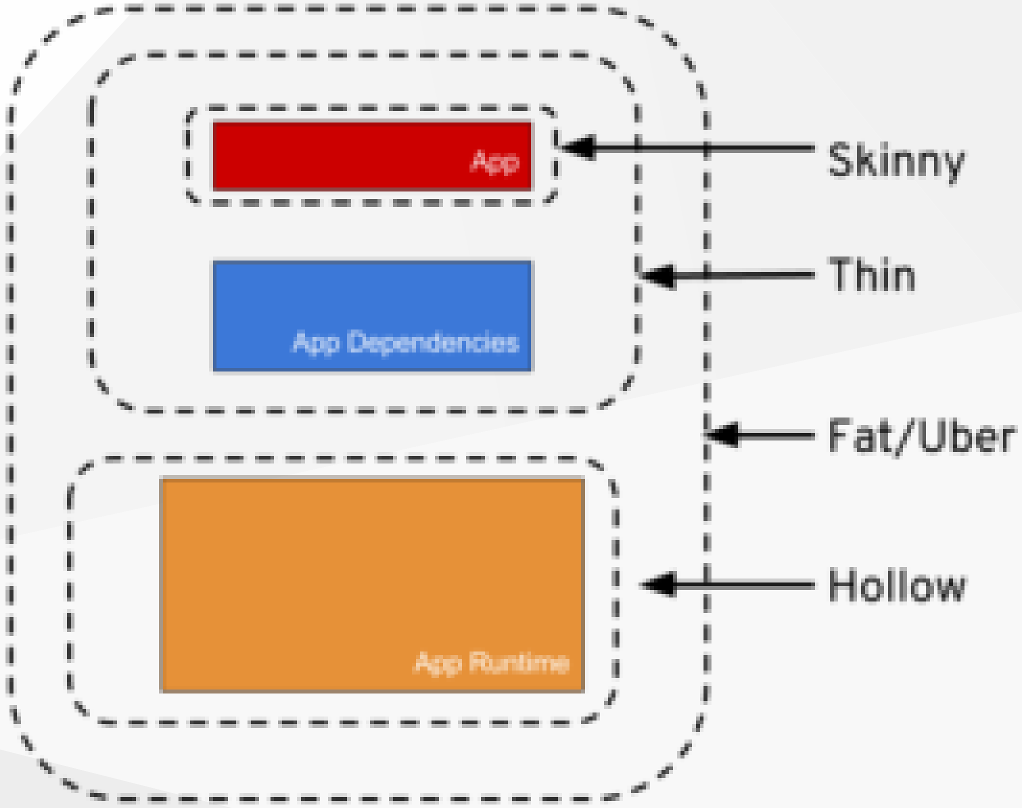
➖ `jctools-core`

➡️ Not found by Gradle plugin?

The fat-jar hidden roommates

- Fat/uber jars don't have transitive dependencies
- But they include dependencies in their archive

➡️ SBOM should show them



Example with netty-common

Shade `org.jctools` as `io.netty.util.internal.shaded.org.jctools`

- Not in pom dependencies
- But information in `META-INF/maven` poms in fat-jar archive

➡️ Syft uses Jar and Gradle plugin uses graph dependencies

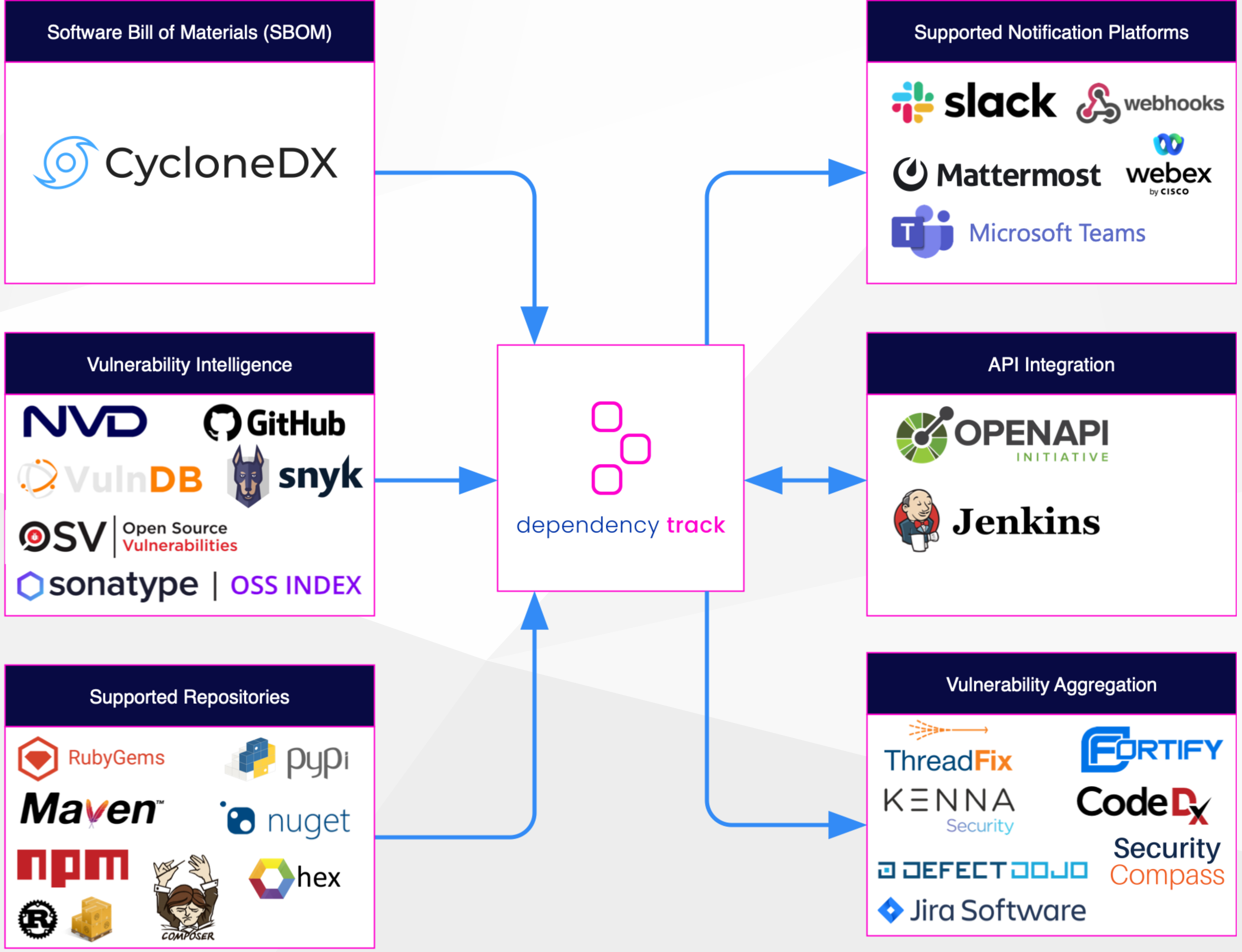
Mixing tools is important!

Some tools to analyze SBOM

- Sonatype BOM Doctor : online CycloneDX SBOM scanner
    - https://bomdoctor.sonatype.com/
- Dependency-track: self-hosted webapp
    - https://dependencytrack.org/
- Grype: cli tool
    - https://github.com/anchore/grype
- Trivy: cli tool
    - https://github.com/aquasecurity/trivy

Dependency-track

- OSS project, developed by OWASP since 2013
- Only support CycloneDX
    - Won't support SPDX (GH#1222)
- CSAF in progress
- Multiple vulnerabilities sources : NVD, Github, Snyk, ...
- Policy management for license and vulnerabilities
- Multiple projects and tracking over time


Software Bill of Materials (SBOM)
CycloneDX
Vulnerability Intelligence
NVD
GitHub
VulnDB
snyk
OSV Open Source Vulnerabilities
sonatype | OSS INDEX
Supported Repositories
RubyGems
pypi
Maven
nuget
npm
hex
COMPOSER
dependency track
Supported Notification Platforms
slack
webhooks
Mattermost
webex by cisco
Microsoft Teams
API Integration
OPENAPI INITIATIVE
Jenkins
Vulnerability Aggregation
ThreadFix
FORTIFY
KENNA Security
CodeDx
DEFECTDOJO
Security Compass
Jira Software

License compliance

- A SBOM with license info can be an artifact for OpenChain conformance
    - An open source license compliance program (ISO/IEC 5230)
    - https://www.openchainproject.org/
- Should use SPDX license id to help analysis

Vulnerabilities report

- A SBOM is huge!
- Many false positives with identifiers
- Not all vulnerabilities are applicable
    - Some studies show 90% are not
- Clients are mostly interested by exploitable vulnerabilities

VEX (Vulnerability Exploitability eXchange)

- Concept defined by CISA (Cybersecurity and Infrastructure Security Agency)
- Machine-readable document
- Indicate if software is affected by a vulnerability
- Contains statements:
    - vulnerability details
    - status: (not) affected, fixed, under investigation

A word about CSAF

- Managed by OASIS Open
- Version 2.0 out since last november
- Enable to disclose and consume security advisories in machine readable format
- Specify distribution and discovery of CSAF documents
- Not a CVE replacement
- https://oasis-open.github.io/csaf-documentation/faq.html

Example with RedHat

CSAF 2.0 publishing since February 2023

- https://www.redhat.com/fr/blog/csaf-vex-documents-now-generally-available
- https://access.redhat.com/security/data/csaf/v2/advisories/

To sum up

- Mix tools to generate SBOM
- Use clear identifiers for components (purl, cpe)
- Load SBOM in various tools to check if identifiers are understood
- Track your dependencies
- Still a debate between publishing
    - a document of only exploitable vulnerabilities
    - a document of all vulnerabilities responses
    - or both ?

Some links to go deeper

- CISA definitions : https://www.cisa.gov/sbom
- CycloneDX specification : https://cyclonedx.org/specification/overview/
- CSAF FAQ : https://oasis-open.github.io/csaf-documentation/faq.html
- VDR vs VEX : https://owasp.org/blog/2023/02/07/vdr-vex-comparison