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# Depending on Vulnerable Libraries

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# A bit about me...

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  - 10 years software development experience
  - SAST enthusiast
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# What are we going to talk about?

- Why should we care?
- Patching programs
- What application teams can do
- Deep dive into dependency-check
- Usage scenarios
- Governance



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# Why should we care?

- **CVE-2016-5000** - Apache POI Information Disclosure via External Entity Expansion (XXE)
- **CVE-2016-4216** - Adobe XMP Toolkit for Java Information Disclosure via External Entity Expansion (XXE)
- **CVE-2016-3081** - Remote code execution vulnerability in Apache Struts when dynamic method invocation is enabled
- **CVE-2015-8103** - Remote code execution vulnerability in Jenkins remoting; related to the Apache commons-collections

# Black Duck - Open Source Security Analysis

- The State of Open Source Security in Commercial Applications
  - <https://info.blackducksoftware.com/rs/872-OLS-526/images/OSSAReportFINAL.pdf>
- 95% of applications include open source
- 67% of applications contained open source vulnerabilities
- Average age of open source vulnerability identified: 1,894 days



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# OWASP Top 10 2013

- Most critical web application risks
- A9 – Using components with known vulnerabilities
  - Prevalence: Widespread
  - Detectability: Difficult
- Difficult for 4 reasons
  - Awareness
  - Visibility
  - Lack of tooling in 2012/2013



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# Patching Programs

- Generally do not cover application dependencies
  - Lack of awareness of 3<sup>rd</sup> party or FOSS application dependencies
  - Patching teams cannot push patches
- Patching application dependencies requires
  - Possible code changes
  - Full regression testing



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# Enter OWASP dependency-check

- Project started December 2011 (first published in 2012)
- Performs Software Composition Analysis
  - Reports known vulnerabilities
- Easy solution to the OWASP 2013 Top 10 A9 Using components with known vulnerabilities
- Works as:
  - Maven Plugin
  - Jenkins Plugin
  - Ant Task
  - Gradle Plugin
  - SBT Plugin
  - Command Line



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# Language/Technology Support

- Fully supported: Java & .NET
- Experimental Analyzers:
  - CocoaPods
  - Swift Package Manager
  - Python
  - PHP (composer)
  - Node.js
  - Ruby



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# HOW DOES IT WORK?



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# Vulnerability Data Source

- National Vulnerability Database (NVD)
  - <https://nvd.nist.gov>
- Contains a listing of Common Vulnerability and Exposures (CVE)
- Each CVE entry contains
  - A description of the vulnerability or exposure
  - A Common Vulnerability Scoring System (CVSS) score
  - A list of the affected platforms identified by their Common Platform Enumeration (CPE)

# Library Identification

- Reporting on known/published vulnerabilities requires the correct identification of the libraries used



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# Library Identification Problems

- Development & Security use different identifiers
- Development (GAV coordinates):
  - `org.springframework:spring-core:3.2.0.RELEASE`
- Security uses Common Platform Enumeration (CPE):
  - `cpe:/a:springsource:spring_framework:3.2.0`
  - `cpe:/a:pivotal:spring_framework:3.2.0`
  - `cpe:/a:pivotal_software:spring_framework:3.2.0`
- No publicly available database exists to map between the two

# Evidence Based Identification

- Evidence is extracted from dependencies
  - File name, manifest, POM, package names, etc.
  - Evidence is grouped into Vendor, Product, and Version collections
- Local copy of the NVD CVE is maintained
- Lucene Index of the CPE information is created
- Evidence collected is used to search the index and identify the library by CPE

# Evidence Based Identification Issues

- False Positives
  - Evidence extracted may cause incorrect identification
- False Negatives
  - If key elements are not included in the dependency (e.g. jar, dll) the library will not be identified and may result in un-reported risk



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# Dealing with False Positives

- Invalid dependency identification can be resolved using a suppression file:

```
<suppress>
  <notes><![CDATA[
    This suppresses false positives identified on spring security.
  ]]></notes>
  <gav regex="true">org\.springframework\.security:spring.*</gav>
  <cpe>cpe:/a:mod_security:mod_security</cpe>
  <cpe>cpe:/a:springsource:spring_framework</cpe>
  <cpe>cpe:/a:vmware:springsource_spring_framework</cpe>
</suppress>
```





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# USING DEPENDENCY-CHECK



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# Onboarding an Application

- Basic steps
  - Configure plugin
    - Proxy configuration
  - Run initial scan
  - Create and configure a suppression file (if needed)
  - Plan the upgrade for identified vulnerable components



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**DEMO**



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# Use Cases for dependency-check

- Prove the existence of the problem
- Baseline test when conducting POCs with commercial solutions
- OWASP dependency-check is used as the primary tool to identify known vulnerable components



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# Enterprise Deployments

- Use a centralized database to maintain the local copy of the NVD
  - Single instance of dependency-check used to update
  - Scanning instances do not need to update
- Use an internal Nexus instead of Maven Central
- Run dependency-check within their CI
- Continuous monitoring/reporting using **OWASP dependency-check sonar plugin**, OWASP dependency-track, or ThreadFix

# Vulnerable Dependencies as Code Quality

- Fail a build if known vulnerabilities are detected
  - Jenkins, gradle, maven, ant plugins
- Put security into your code quality metrics
  - OWASP dependency-check sonar plugin



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# Governance

- Known vulnerable dependencies are only one part of the software composition problem
- Organizations should:
  - Control what dependencies are allowed
    - Cleared by architecture, legal, and security reviews
    - Must be easy/quick to engage the governance process



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**QUESTIONS?**



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# More Information

- OWASP dependency-check
  - <http://jeremylong.github.io/DependencyCheck/>
- OWASP dependency-track
  - <https://github.com/stevespringett/dependency-track>
- OWASP dependency-check-sonar-plugin
  - <https://github.com/stevespringett/dependency-check-sonar-plugin>



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# More Information

- Related Projects
  - [Ruby Bundler-Audit](#)
  - [Retire.js](#)
  - [Node Security Project](#)



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