Workshop

"Free" DevSecOps with Open Source Tools

OOP 2021

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Agenda

"was tun wir hier eigentlich?"

Java - Dependencies / Libraries

Docker - Betriebssystem*

API - selbstgemachte Probleme

Christian Kühn

Software - Entwickler

#java #kubernetes #DevOops

@DevOpsKA Meetup Organizer

dmTECH GmbH

100% dm-Tochter

komplette Konzern-IT
Hardware
Software
Betrieb

questions?!

software security issues:
what could possibly go wrong?

- leakage of business data
- leakage of user/customer data
- service interruption
- industry malfunction
- death (😱)

examples:

equifax - “Credit Monitoring”

hacked 2017
vulnerability in Apache Struts dependency

143,000,000 SSN
209,000 credit card numbers
182,000 “consumers” with PII

https://krebsonsecurity.com/2017/09/the-equifax-breach-what-you-should-know/

examples:

Mossack Fonseca - “Law Firm and coprorate service provider”

hacked 2015
vulnerability in Drupal

11.5 million leaked documents about
money laundering
tax avoidance
corruption

https://en.wikipedia.org/wiki/Panama_Papers

what stops developers from patching?

negligence

priorities / lack of time

skills / training

insight

“security - not my department” (or is it?)

A9:2017-Using Components with Known Vulnerabilities

Components, such as libraries, frameworks, and other software modules, run with the same privileges as the application. If a vulnerable component is exploited, such an attack can facilitate serious data loss or server takeover. Applications and APIs using components with known vulnerabilities may undermine application defenses and enable various attacks and impacts.

T10 OWASP Top 10 Application Security Risks – 2017

6

A1:2017-Injection	Injection flaws, such as SQL, NoSQL, OS, and LDAP injection, occur when untrusted data is sent to an interpreter as part of a command or query. The attacker's hostile data can trick the interpreter into executing unintended commands or accessing data without proper authorization.
A2:2017-Broken Authentication	Application functions related to authentication and session management are often implemented incorrectly, allowing attackers to compromise passwords, keys, or session tokens, or to exploit other implementation flaws to assume other users' identities temporarily or permanently.
A3:2017-Sensitive Data Exposure	Many web applications and APIs do not properly protect sensitive data, such as financial, healthcare, and PII. Attackers may steal or modify such weakly protected data to conduct credit card fraud, identity theft, or other crimes. Sensitive data may be compromised without extra protection, such as encryption at rest or in transit, and requires special precautions when exchanged with the browser.
A4:2017-XML External Entities (XXE)	Many older or poorly configured XML processors evaluate external entity references within XML documents. External entities can be used to disclose internal files using the file URI handler, internal file shares, internal port scanning, remote code execution, and denial of service attacks.
A5:2017-Broken Access Control	Restrictions on what authenticated users are allowed to do are often not properly enforced. Attackers can exploit these flaws to access unauthorized functionality and/or data, such as access other users' accounts, view sensitive files, modify other users' data, change access rights, etc.
A6:2017-Security Misconfiguration	Security misconfiguration is the most commonly seen issue. This is commonly a result of insecure default configurations, incomplete or ad hoc configurations, open cloud storage, misconfigured HTTP headers, and verbose error messages containing sensitive information. Not only must all operating systems, frameworks, libraries, and applications be securely configured, but they must be patched and upgraded in a timely fashion.
A7:2017-Cross-Site Scripting (XSS)	XSS flaws occur whenever an application includes untrusted data in a new web page without proper validation or escaping, or updates an existing web page with user-supplied data using a browser API that can create HTML or JavaScript. XSS allows attackers to execute scripts in the victim's browser which can hijack user sessions, deface web sites, or redirect the user to malicious sites.
A8:2017-Insecure Deserialization	Insecure deserialization often leads to remote code execution. Even if deserialization flaws do not result in remote code execution, they can be used to perform attacks, including replay attacks, injection attacks, and privilege escalation attacks.
A9:2017-Using Components with Known Vulnerabilities	Components, such as libraries, frameworks, and other software modules, run with the same privileges as the application. If a vulnerable component is exploited, such an attack can facilitate serious data loss or server takeover. Applications and APIs using components with known vulnerabilities may undermine application defenses and enable various attacks and impacts.
A10:2017-Insufficient Logging & Monitoring	Insufficient logging and monitoring, coupled with missing or ineffective integration with incident response, allows attackers to further attack systems, maintain persistence, pivot to more systems, and tamper, extract, or destroy data. Most breach studies show time to detect a breach is over 200 days, typically detected by external parties rather than internal processes or monitoring.

OWASP

Open Web Application Security Project

solution

search for known vulnerabilities

implement a process to fix ASAP (or whitelist 😇)

treat security issues like technical debt

automate the sh!t out of it

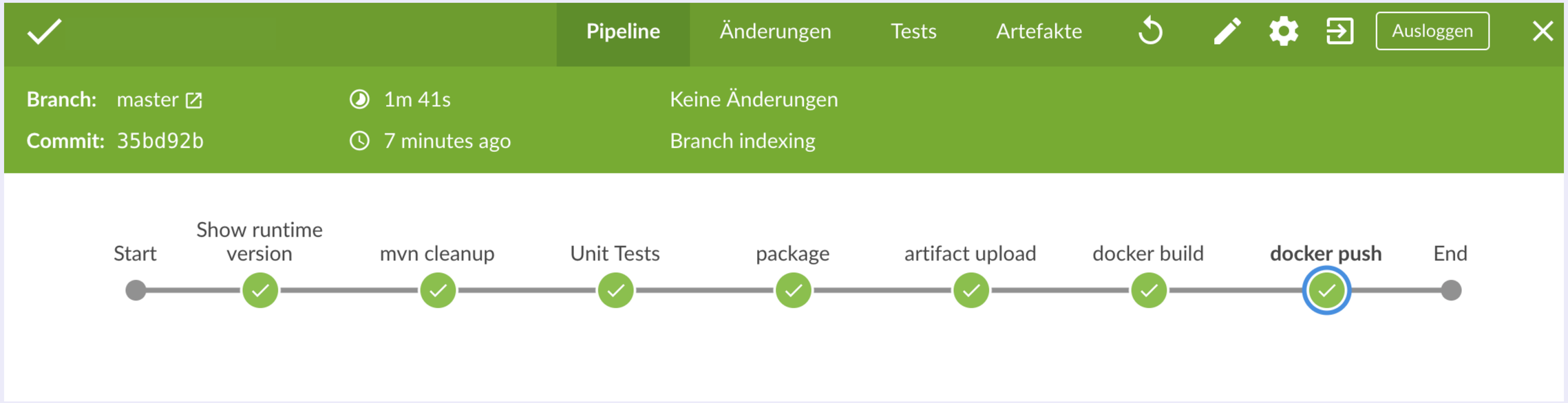
let's automatically find KNOWN vulnerabilities in

dependencies / 3rd party libs

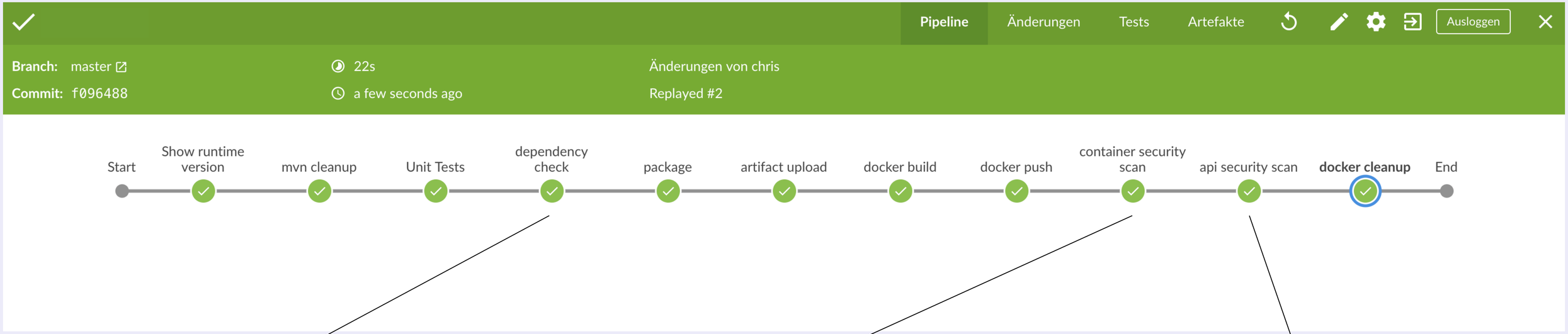
components in docker images

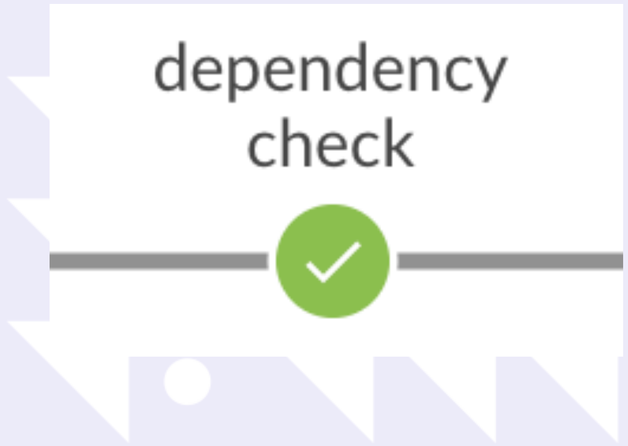
let's also scan our app dynamically

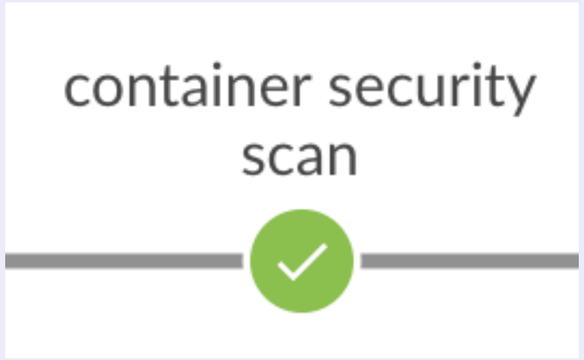
continuous delivery today



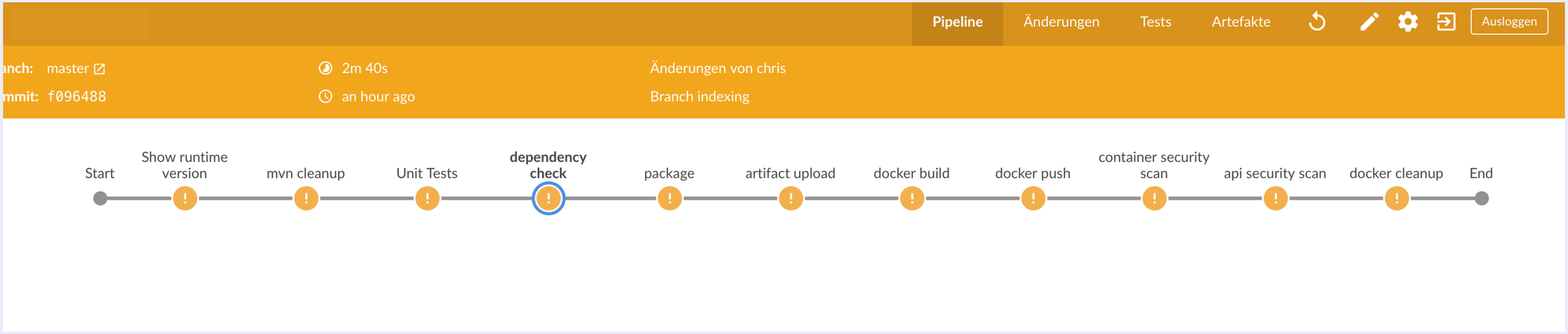
continuous delivery ++







continuous delivery++



CVE - Common Vulnerabilities and Exposures

```
vulnerability
/vʌln(ə)rə'bɪlɪti/
noun

the quality or state of being exposed to the possibility of
being attacked or harmed, either physically or emotionally.

…
```

CVE - reference for publicly known information-security vulnerabilities and exposures

CVE-2017-5638 Detail

MODIFIED

This vulnerability has been modified since it was last analyzed by the NVD. It is awaiting reanalysis which may result in further changes to the information provided.

Current Description

The Jakarta Multipart parser in Apache Struts 2 2.3.x before 2.3.32 and 2.5.x before 2.5.10.1 has incorrect exception handling and error-message generation during file-upload attempts, which allows remote attackers to execute arbitrary commands via a crafted Content-Type, Content-Disposition, or Content-Length HTTP header, as exploited in the wild in March 2017 with a Content-Type header containing a #cmd= string.

Source: MITRE
Description Last Modified: 09/22/2017
View Analysis Description

Impact

CVSS v3.0 Severity and Metrics:

Base Score: 10.0 CRITICAL
Vector: AV:N/AC:L/PR:N/UI:N/S:C/C:H/I:H/A:H (V3 legend)
Impact Score: 6.0
Exploitability Score: 3.9

Attack Vector (AV): Network
Attack Complexity (AC): Low
Privileges Required (PR): None
User Interaction (UI): None
Scope (S): Changed

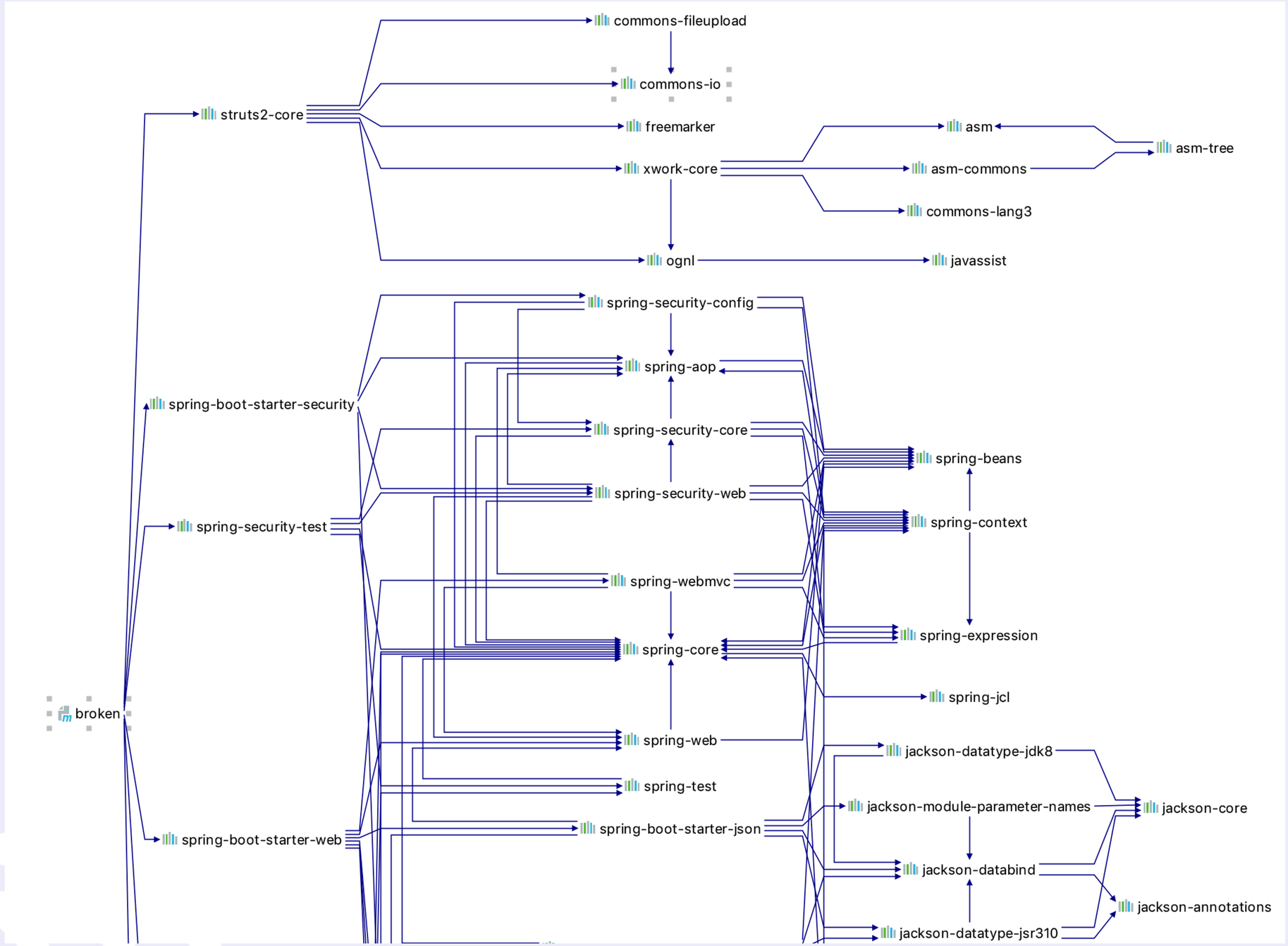
CVSS v2.0 Severity and Metrics:

Base Score: 10.0 HIGH
Vector: (AV:N/AC:L/Au:N/C:C/I:C/A:C) (V2 legend)
Impact Subscore: 10.0
Exploitability Subscore: 10.0

Access Vector (AV): Network
Access Complexity (AC): Low
Authentication (AU): None
Confidentiality (C): Complete
Integrity (I): Complete
Availability (A): Complete

QUICK INFO

CVE Dictionary Entry:
CVE-2017-5638
NVD Published Date:
03/10/2017
NVD Last Modified:
03/03/2018


commons-fileupload
commons-io
struts2-core
freemarker
asm
asm-tree
xwork-core
asm-commons
commons-lang3
ognl
javassist
spring-security-config
spring-aop
spring-boot-starter-security
spring-security-core
spring-beans
spring-security-web
spring-context
spring-security-test
spring-webmvc
spring-expression
spring-core
spring-jcl
broken
spring-web
jackson-datatype-jdk8
spring-test
jackson-module-parameter-names
jackson-core
spring-boot-starter-json
spring-boot-starter-web
jackson-databind
jackson-annotations
jackson-datatype-jsr310

dependencies

example: little maven/springboot demo-project:
github.com/cy4n/broken

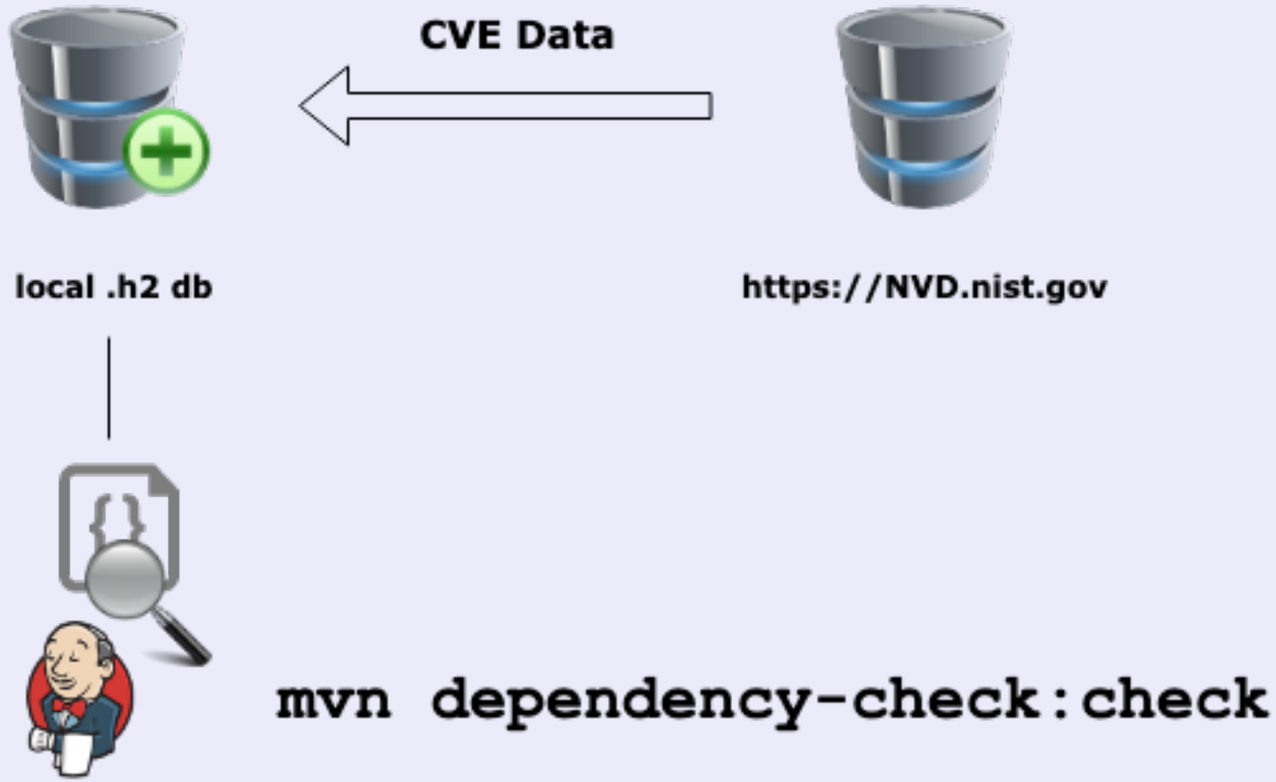
6 maven dependencies

~70 transitive dependencies

find vulnerable dependencies

DEPENDENCY-CHECK


DEPENDENCY-CHECK


CVE Data
local .h2 db
https://NVD.nist.gov
mvn dependency-check:check

let's try it

let's automate it

image pre-filled with database, updated nightly

use pre-filled data packed in image

run from gitlab scheduler,
fail hard on any found vulnerability

run in any merge-request to avoid introduction of new vulnerabilies

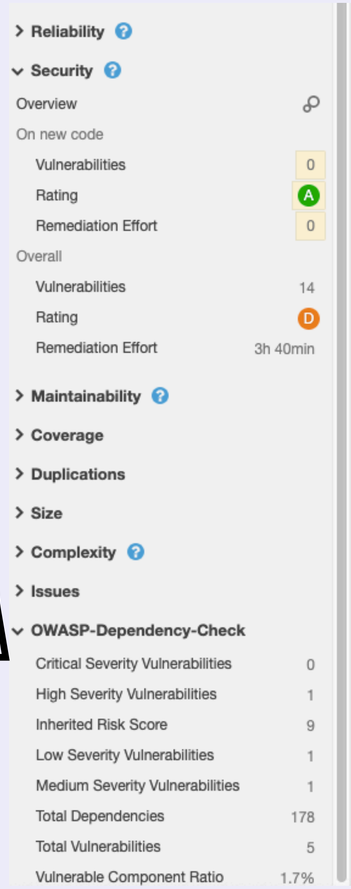
```
Dependency Check:
  stage: check
  image: registry.gitlab.demo.de/dependency-check-data
  variables:
    GIT_DEPTH: 0
    HTML_REPORT_FILE: dependency-check-report.html
    REPORT_TARGET: target/dependency-check-reports
  script:
    - ./mvnw dependency-check:check -DdataDirectory=/dependency-check/dependency-check-data
  after_script:
    - ./scripts/publish_report.sh
  artifacts:
    when: always
    expire_in: 14 days
    paths:
      - $REPORT_TARGET
    reports:
      junit: $REPORT_TARGET/dependency-check-junit.xml
  rules:
    - if: '$CI_PIPELINE_SOURCE == "schedule" && $DEPENDENCY_CHECK_SCHEDULED == "true"'
      when: always
      allow_failure: false
    - if: '$CI_PIPELINE_SOURCE == "merge_request_event"'
      when: always
      allow_failure: true
```

DEPENDENCY-CHECK

Issues

OWASP-Dependency-Check

Critical Severity Vulnerabilities	0
High Severity Vulnerabilities	1
Inherited Risk Score	9
Low Severity Vulnerabilities	1
Medium Severity Vulnerabilities	1
Total Dependencies	178
Total Vulnerabilities	5
Vulnerable Component Ratio	1.7%



DEPENDENCY-CHECK

dependency track

dm TECH

break?!

containers

```
docker pull cy4n/broken
```

```
FROM cy4n/broken:latest
```

trivy

docker hub

clair

RED HAT® Quay.io

https://github.com/aquasecurity/trivy

dm TECH

* pre-compiled vulnerability-db from
  https://github.com/aquasecurity/trivy-db

* standalone or client/server mode
* created with CI/CD in mind
* detects vulnerabilities in most linux-based images
* detects dependency vulnerabilities (ruby, php, node ...)

let's try it

let's automate it

basic linux image pre-filled with database, trivy installed and updated nightly

```
Container Test:
  stage: check
  image: registry.gitlab.dm.test/trivy
  variables:
    GIT_DEPTH: 0
  script:
    - trivy image -o trivy_report.json cy4n/broken:$CI_COMMIT_SHA
  artifacts:
    when: always
    expire_in: 14 days
    paths:
      - trivy_report.json
    rules:
    - if: '$CI_PIPELINE_SOURCE == "schedule" && $DEPENDENCY_CHECK_SCHEDULED == "true"'
      when: always
      allow_failure: false
    - if: '$CI_PIPELINE_SOURCE == "merge_request_event"'
      when: always
      allow_failure: true
```

scan the container image for this commit, built earlier in this pipeline

scheduled check

alert on new vulnerabilities that get added in code changes,
i.e. Dockerfile updates


ools Help
URL: http://www.internet.com

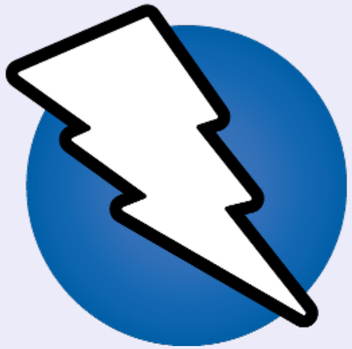
API / Webserver

ZAProxy

burp

API / Webserver

OWASP ZAProxy



url spider
passive (and active) modes
dynamic scanner
ajax supported

zap2docker

myApp

```
docker run -t owasp/zap2docker-stable zap-baseline.py -t http://<URL>
```

HTTP

let's try it

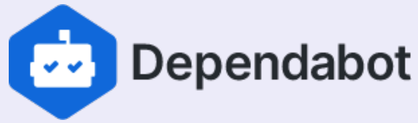
Discussion?!

now that we know our app is (hopefully not) insecure…

who fixes findings and what is their prio?

Spoilers:

automated dependency-updates via pull request



Thank you!

feedback (also questions):

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