CLOUDSEC 2023
ENVISION IT

오픈소스 라이브러리 방화벽을 통한 취약점 탐지수정의 한계성 극복

최경철 kchoi@opentext.com

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TREND MICRO

Agenda

1. 오픈소스 라이브러리 이해
2. 소나타입 플랫폼 소개 및 데모
   - (1) 컴포넌트 취약점 탐지 및 통제(Lifecycle)
   - (2) 컴포넌트 저장소(Nexus Repository)
   - (3) 컴포넌트 방화벽(Repository Firewall)

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오픈소스 라이브러리 이해

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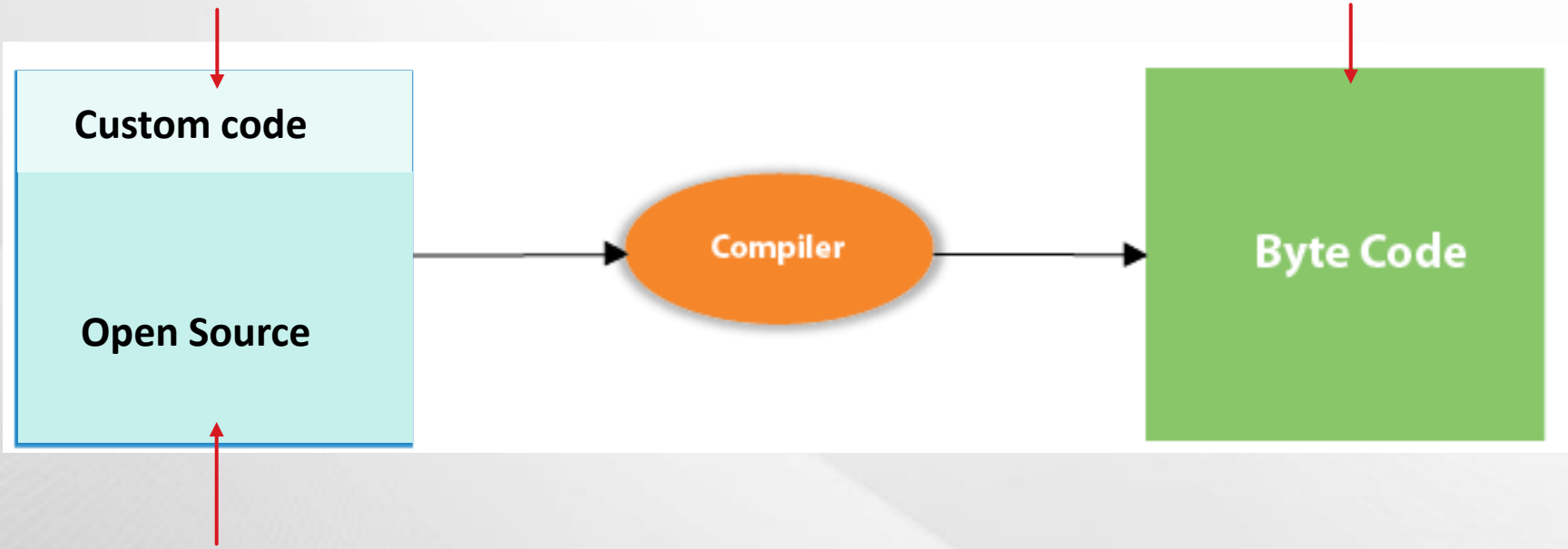
애플리케이션 보안 테스팅 - SAST, SCA, DAST

SAST(Static Application Security Testing)

"소프트웨어 보안약점 점검"

DAST(Dynamic Application Security Testing)

"웹 취약점 점검"



SCA(Software composition analysis)

"오픈소스 라이브러리 취약점 점검"

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패키지 매니저

✓ 패키지(라이브러리 등)를 관리(추가, 수정, 삭제)하는 작업을 자동화 및 관리하기 위한 도구

Language	Package Manager
PHP	Composer
Java	Maven
Ruby	RubyGems
Python	pip
Web frontend	Bower
Node.js & JavaScript	NPM

pom.xml (BookStore)

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.
    <modelVersion>4.0.0</modelVersion>

    <groupId>com.example.maven</groupId>
    <artifactId>BookStore</artifactId>
    <packaging>pom</packaging>
    <version>1.0-SNAPSHOT</version>
    <modules...>
     <profiles>
        <profile...>
        <profile>
            <id>productionServer</id>
            <properties>
                <database.url>
                    jdbc:postgresql://host/database
                </database.url>
            </properties>
            <dependencies>
                <dependency>
                    <groupId>org.postgresql</groupId>
                    <artifactId>postgresql</artifactId>
                    <version>9.4-1206-jdbc4</version>
                </dependency>
            </dependencies>
        </profile>
```


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패키지 의존성

✓ pom.xml 에 Junit 라이브러리 지정시, ***정의하지 않은 의존성 라이브러리(hamcrest-core-1.3.jar) 자동 다운로드***

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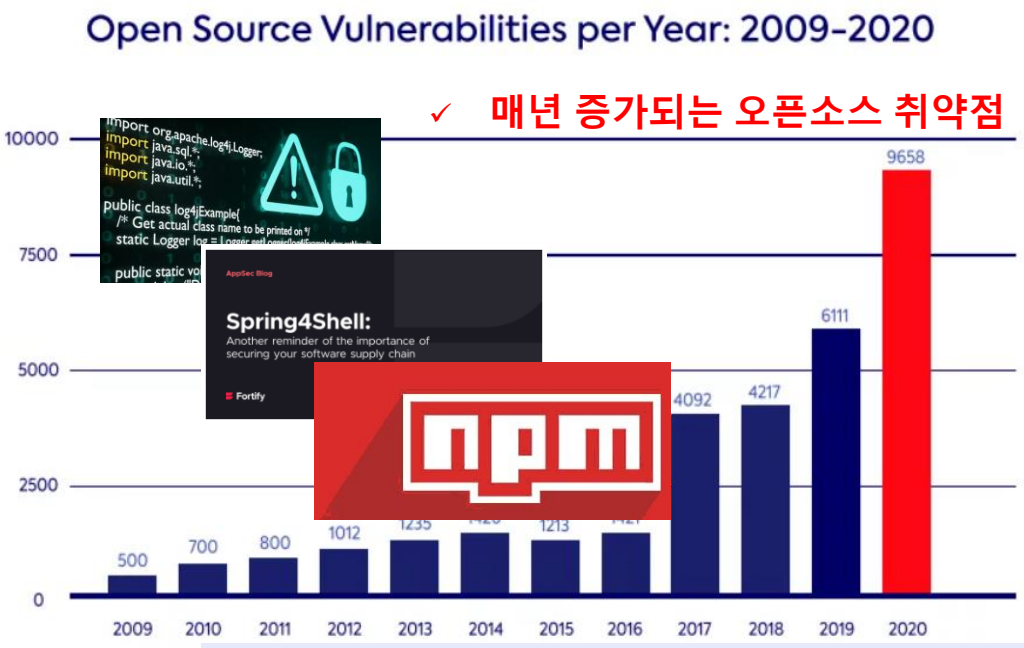
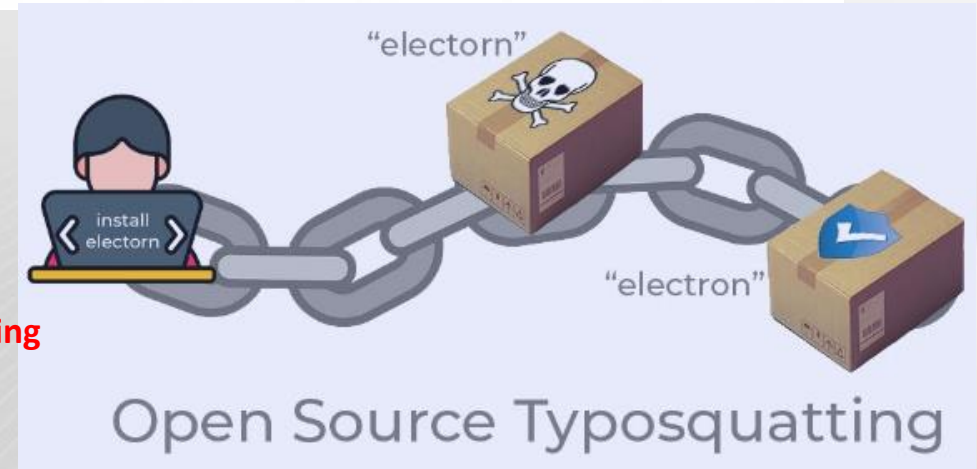
오픈소스 라이브러리 취약점



✓ 매년 증가되는 오픈소스 취약점



✓ **Typesquatting**

(오타)

https://www.activestate.com/resources/quick-reads/how-open-source-typosquatting-attacks-work/

✓ **Dependency confusion**

(의존성 혼동)

https://openchain-project.github.io/OpenChain-KWG/meeting/12th/OpenSourceVulnerability_20211220.pdf

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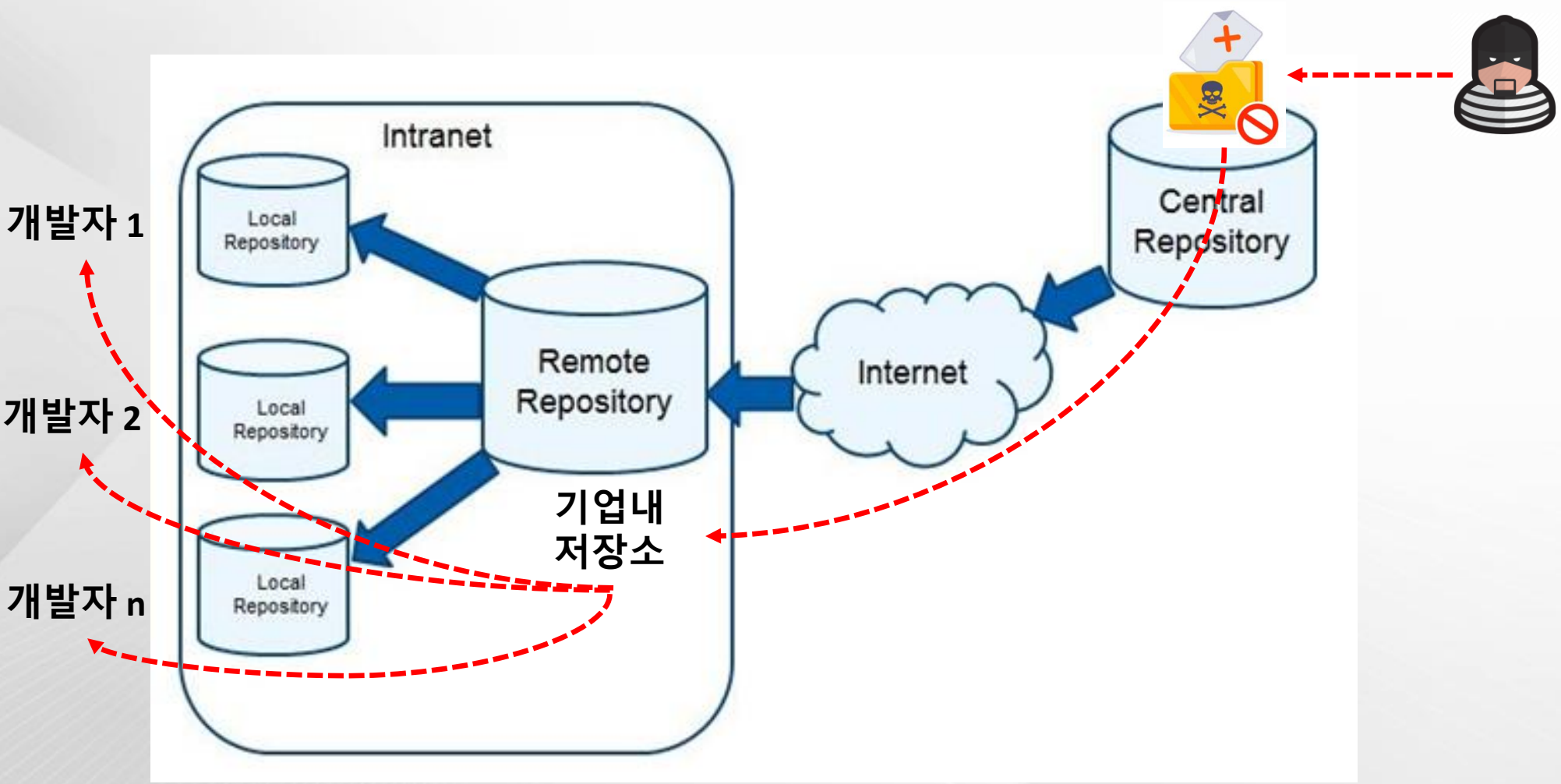
오픈소스 라이브러리 관리



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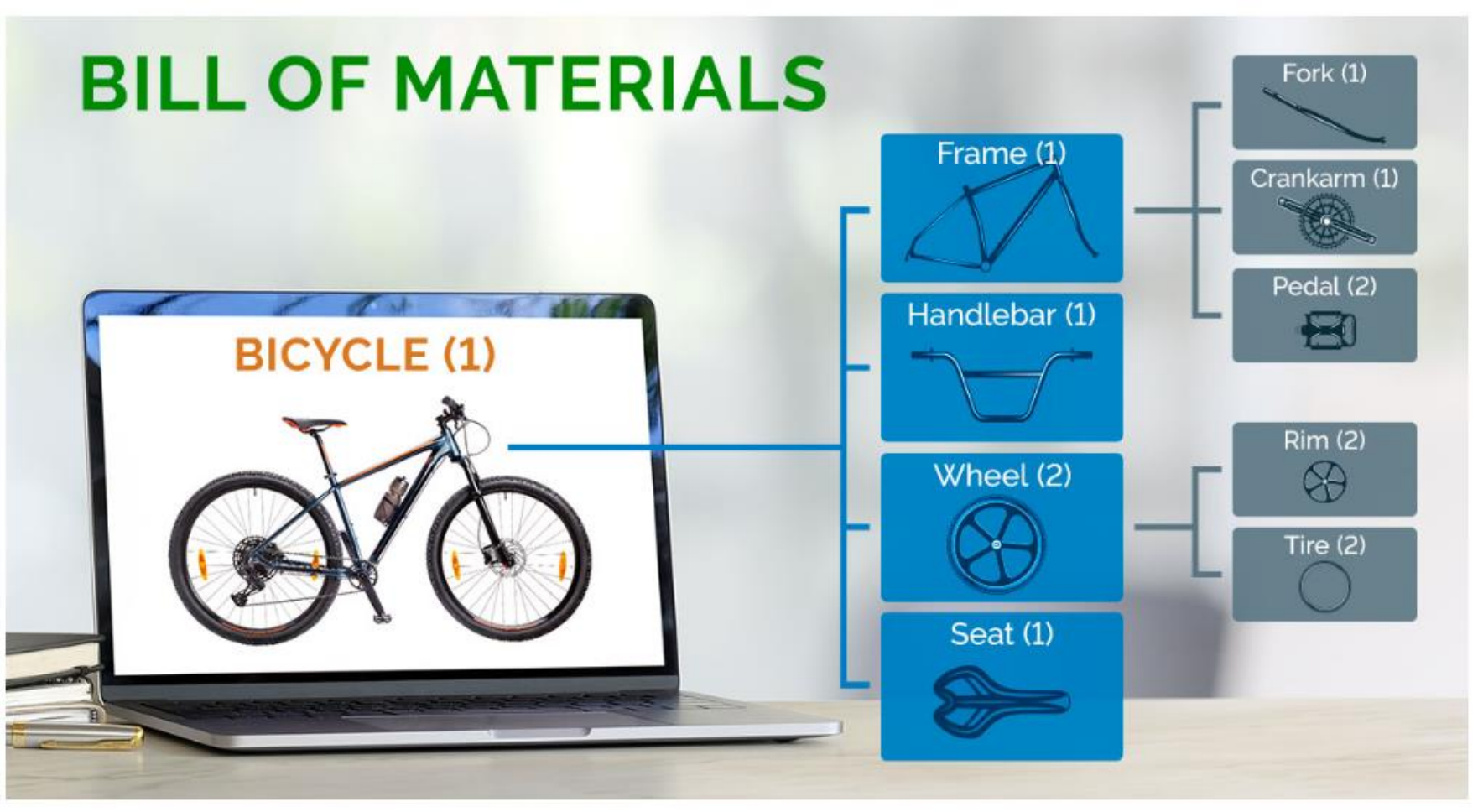
BOM(Bill of Materials)

✓ 자재명세서



https://www.arenasolutions.com/resources/glossary/bill-of-materials/

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SBOM(Software Bill of Materials)

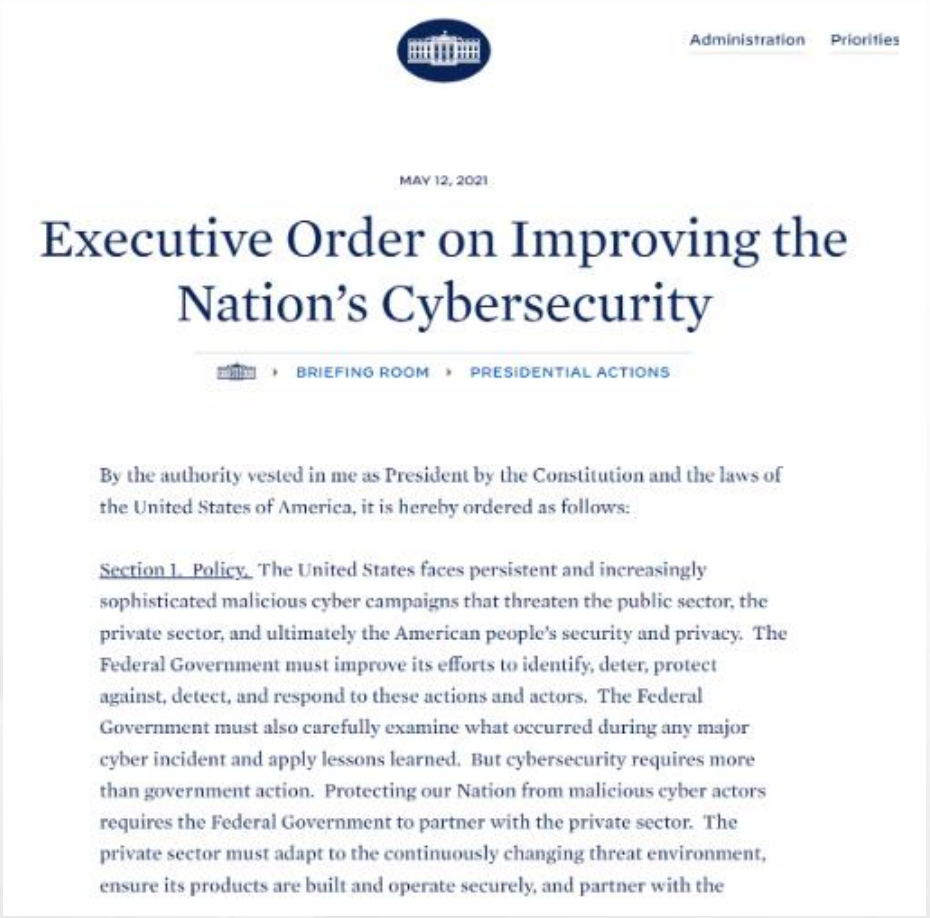
✓ SBOM이란? 취약점 식별 및 관리를 위한 식별정보

Elements

		% Daily Value*
Supplier Name	The name of an entity that creates, defines, and identifies components.	%
Component Name	Designation assigned to a unit of software defined by the original supplier.	
Version of the Component	Ident a cha ident	
Other Unique Identifiers	Othe comp relev	
Dependency Relationship	Char upst	%
Author of SBOM Data	The name of the entity that creates the SBOM data for this component.	
Timestamp	Record of the date and time of the SBOM data assembly.	%

- 제공자 이름
- 컴포넌트 이름
- 컴포넌트 버전
- 해쉬정보
- 컴포넌트 의존성
- 타임스탬프

https://soos.io/sbom-101-what-is-an-sbom-why-are-they-important



Administration Priorities

MAY 12, 2021

Executive Order on Improving the Nation's Cybersecurity

BRIEFING ROOM › PRESIDENTIAL ACTIONS

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Policy. The United States faces persistent and increasingly sophisticated malicious cyber campaigns that threaten the public sector, the private sector, and ultimately the American people's security and privacy. The Federal Government must improve its efforts to identify, deter, protect against, detect, and respond to these actions and actors. The Federal Government must also carefully examine what occurred during any major cyber incident and apply lessons learned. But cybersecurity requires more than government action. Protecting our Nation from malicious cyber actors requires the Federal Government to partner with the private sector. The private sector must adapt to the continuously changing threat environment, ensure its products are built and operate securely, and partner with the

미국대통령 행정명령 – 연방정부 계약기업, SBOM제출의무화

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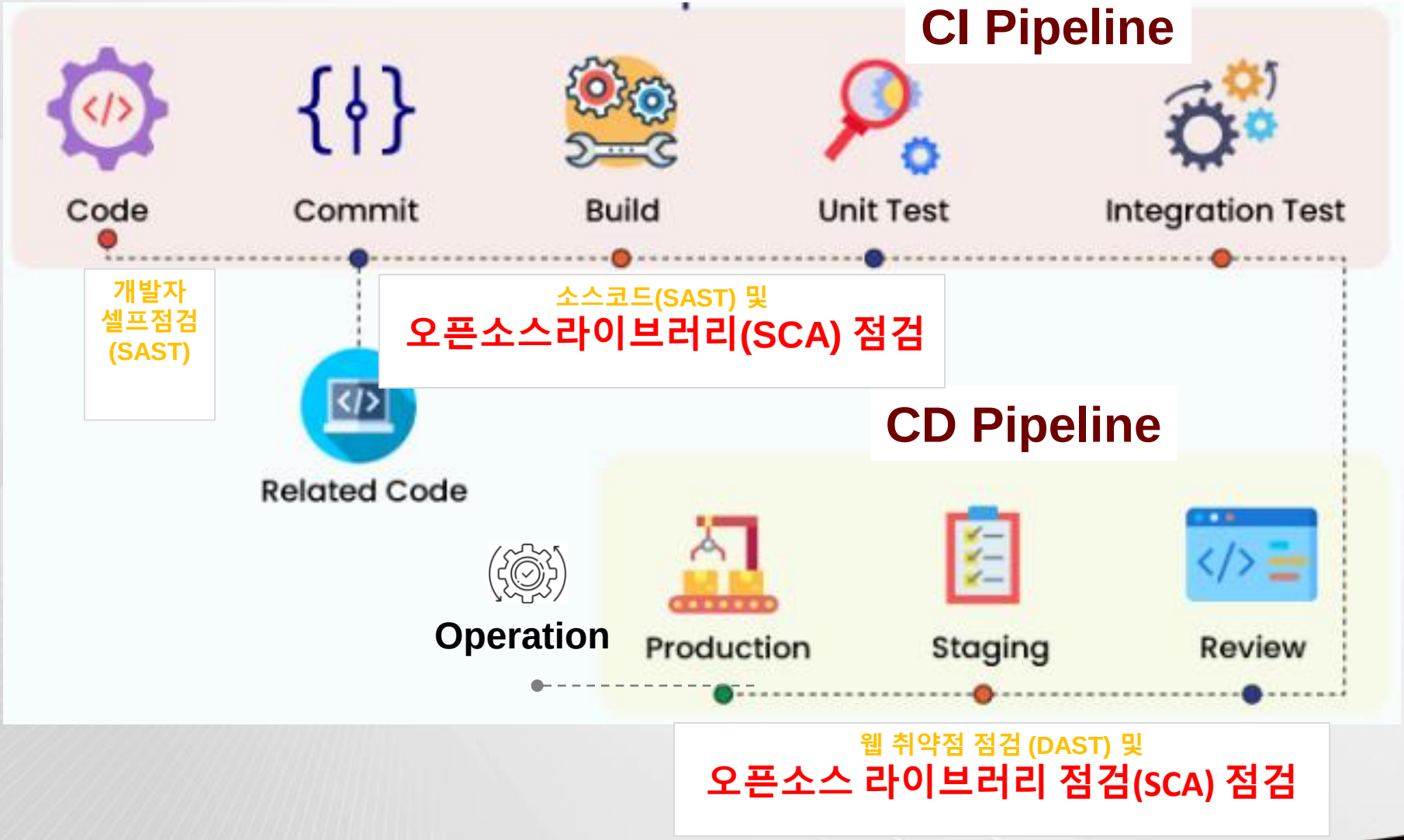
오픈소스 라이브러리 점검방식



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Sonatype 플랫폼

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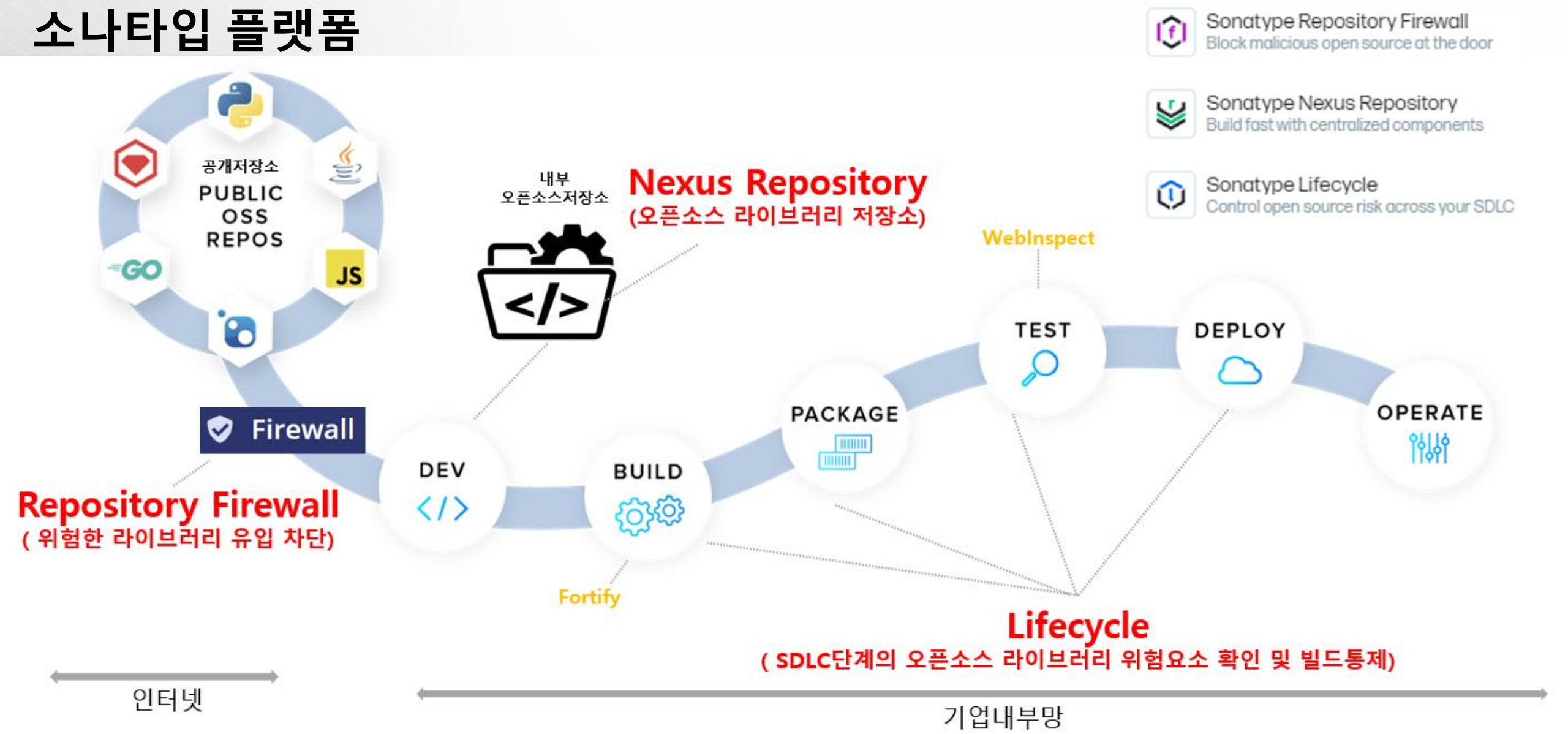
소나타입 플랫폼


Sonatype Repository Firewall
Block malicious open source at the door
Sonatype Nexus Repository
Build fast with centralized components
Sonatype Lifecycle
Control open source risk across your SDLC
공개저장소
PUBLIC
OSS
REPOS
내부
오픈소스저장소
Nexus Repository
(오픈소스 라이브러리 저장소)
WebInspect
Firewall
DEV
BUILD
PACKAGE
TEST
DEPLOY
OPERATE
Repository Firewall
(위험한 라이브러리 유입 차단)
Fortify
Lifecycle
(SDLC단계의 오픈소스 라이브러리 위험요소 확인 및 빌드통제)
인터넷
기업내부망

라이프사이클

(Sonatype Lifecycle)

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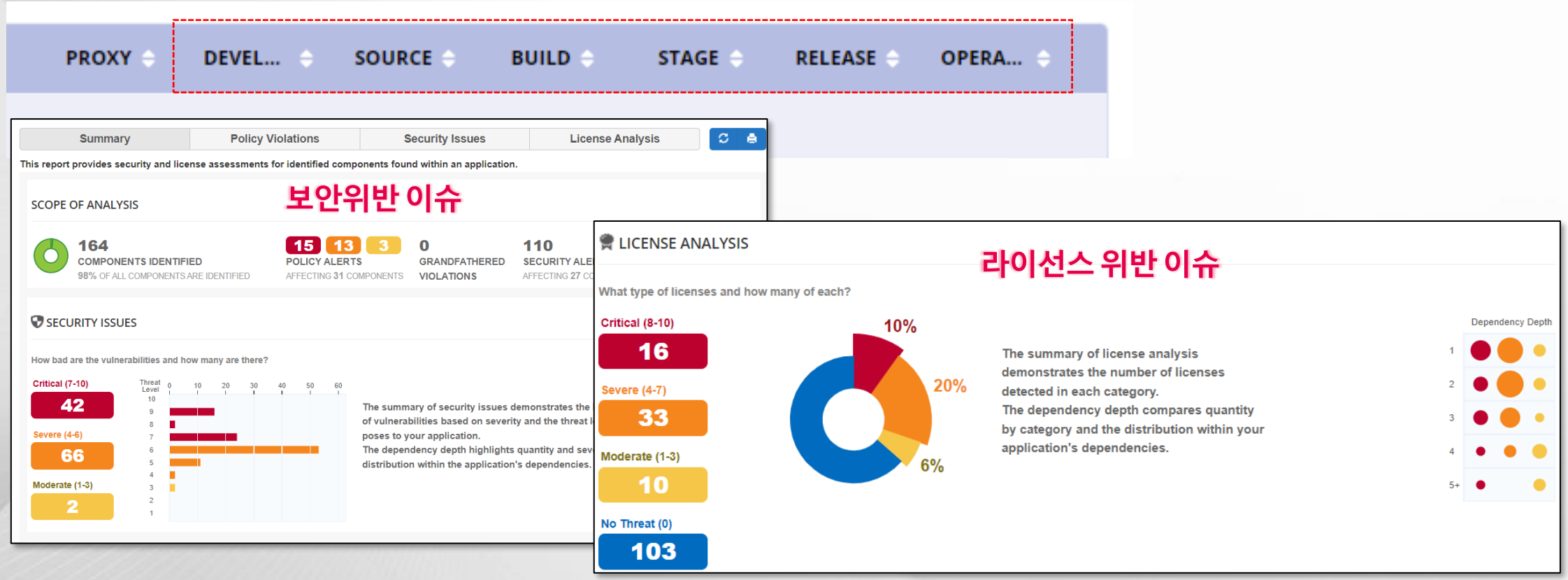
Lifecycle

✓ Lifecycle은 SDLC단계에서 발생가능한 “**CVE취약점**” 및 “**라이선스위반사항**”을 탐지하고, 통제할 수 있는 수단제공



✓ Policy Violations 매뉴 : CVE 취약점 , Component 상태 및 노후상태정보(5년이상 오래되거나 사용인기도 낮음)
✓ Security 매뉴 : CVE 취약점
✓ Legal 매뉴 : 라이선스 유형(위반사항 포함)

Lifecycle

✓ Lifecycle은 Stages별(Proxy제외, Develop ~ Operate 단계) 정책적용

	NAME	PROXY	DEVEL...	SOURCE	BUILD	STAGE	RELEASE	OPERA...	
Local to Root Organization									
10	Security-Namespace Conflict	Fail	—	—	—	—	—	—	›
10	Security-Malicious	Fail	Fail	Fail	Fail	Fail	Fail	Fail	›
10	Security-Critical	—							
10	License-Banned	—							
9	Security-High	—							
9	License-None	—	—	—	—	—	—	—	›
9	Integrity-Rating	Fail	—	—	—	—	—	—	›

✓ Stages 별 정책여부 결정(No action, Warn, Fail)

(예) Security-Malicious 로 판단되는 라이브러리의 경우, CI/CD단계에서 Fail 처리

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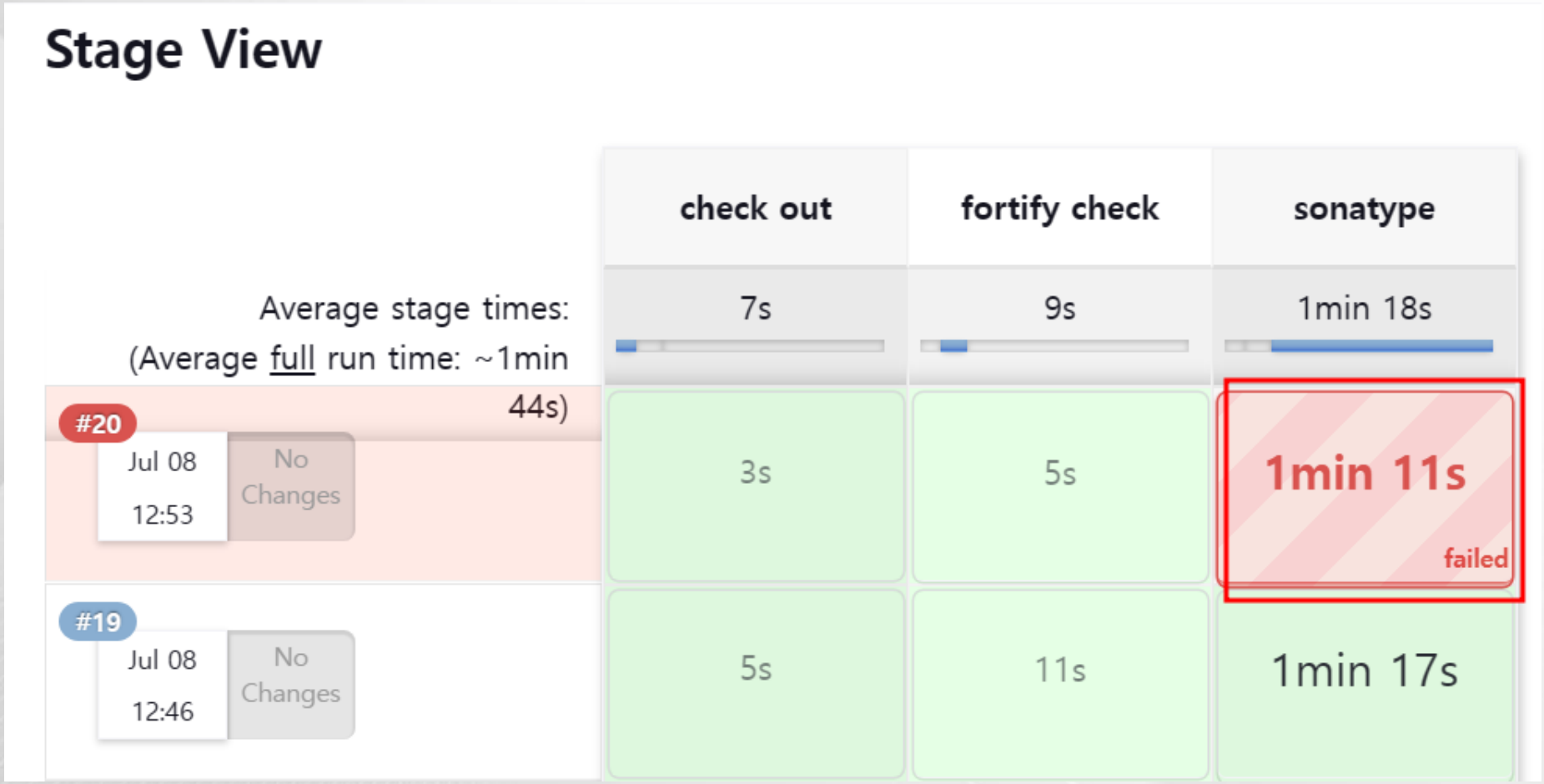
데모 – CI툴 탐지조건에 따른 빌드 Fail 강제

✓ 연동된 CI툴 build 단계에서 특정조건에(위험도 심각) 따른 build stage 에 대한 Warning(경고) 혹은 fail(실패) 강제



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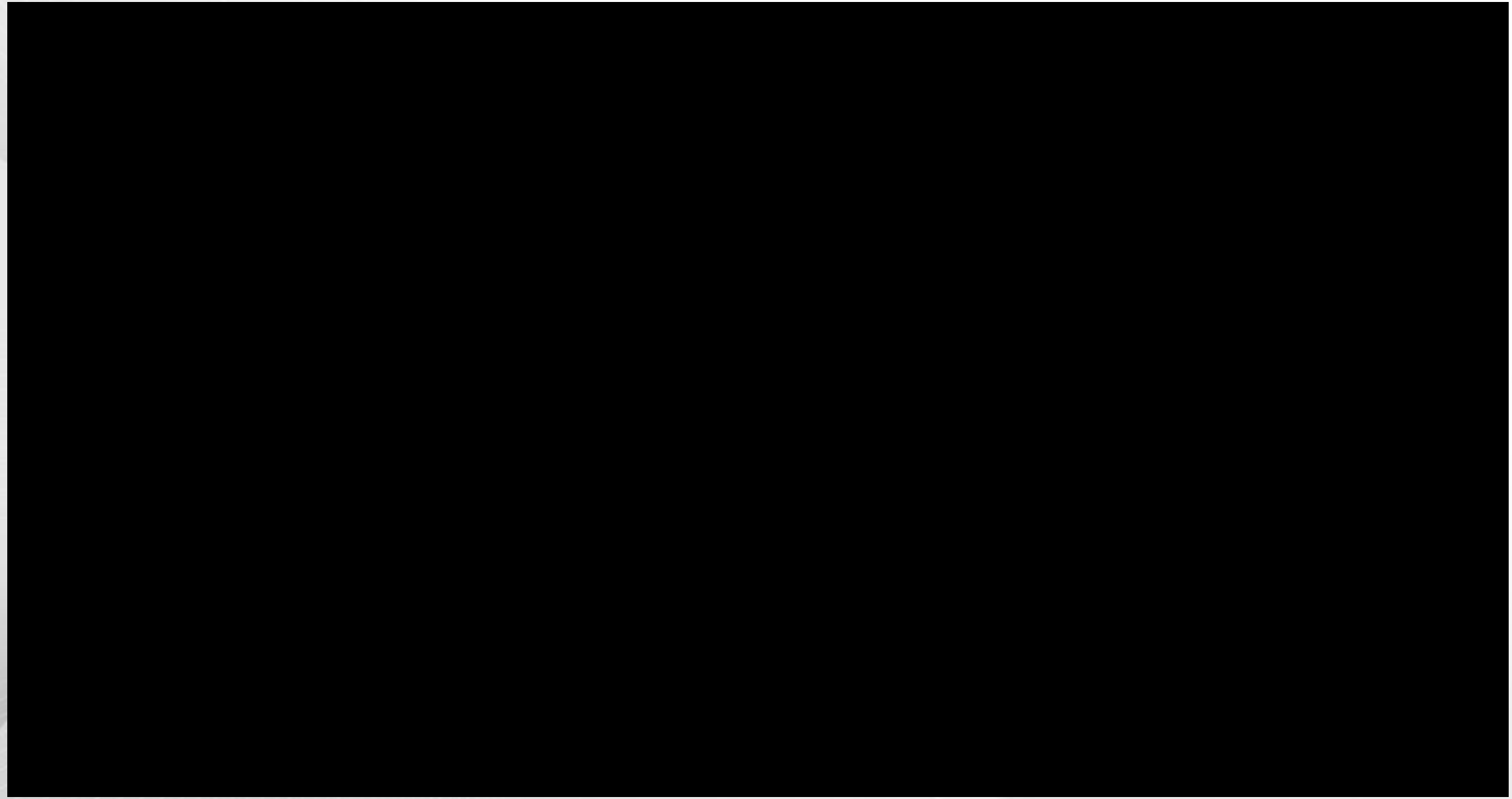

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넥서스 리포지토리

(Sonatype Nexus Repository)

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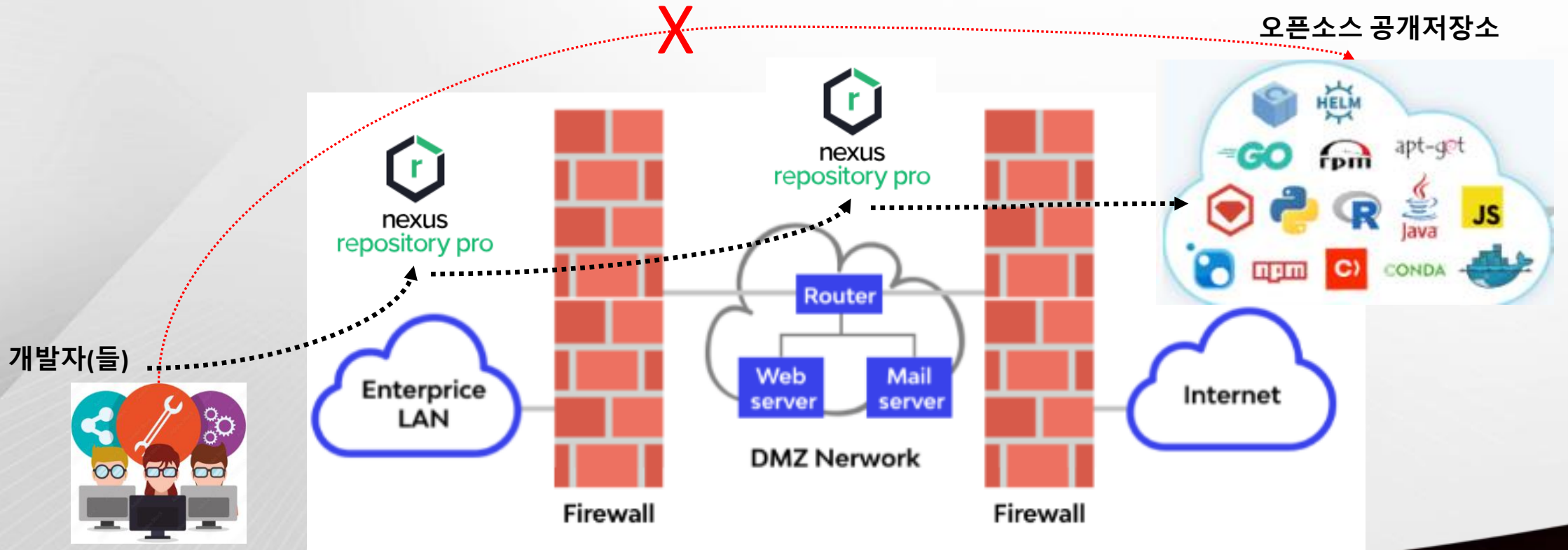
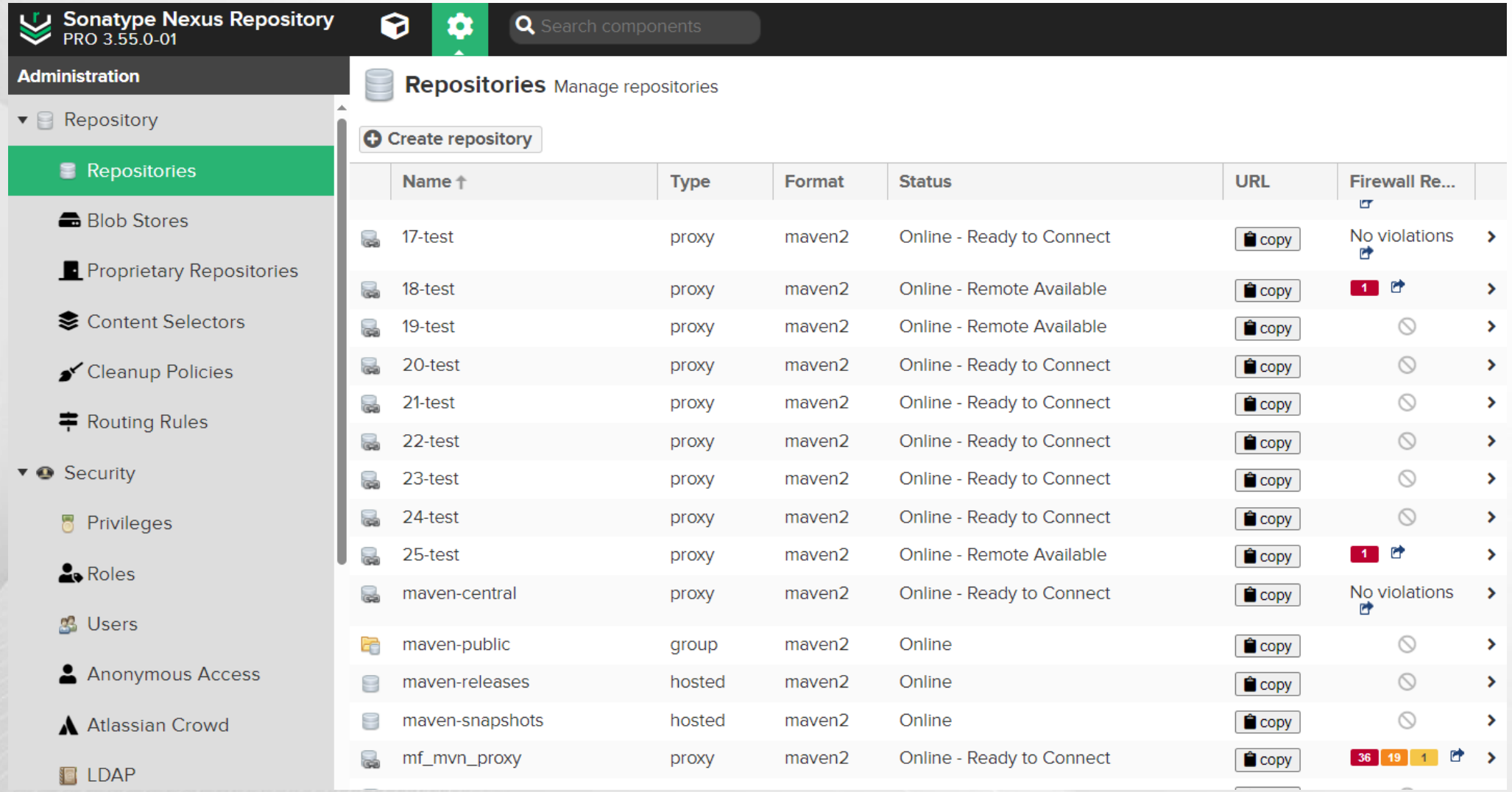
Nexus Repository

- ✓ 기업내 업무효율 및 보안을 위해 사용하는 라이브러리 Repository
  - ✓ 공공/기업 80%이상이 Nexus Repository Community버전 사용
  - ✓ 인터넷 접속제한이 있는 내부망
  - ✓ 공용라이브러리의 버전관리 및 팀간 공유/배포 어려움 해소



Nexus Repository



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저장소 방화벽

(Sonatype Repository Firewall)

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Repository Firewall

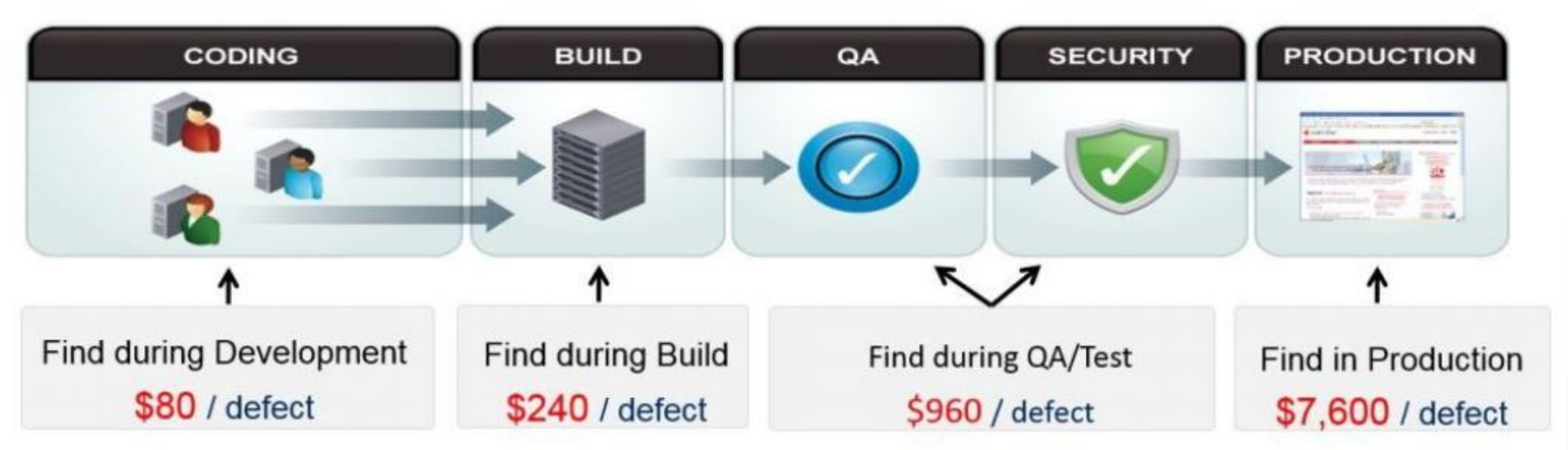
Sonatype Repository Firewall vs 보안솔루션 비교

구분	주요 기능	오픈소스 라이브러리 보안기능
네트워크 방화벽	• 특정포트 및 IP 차단	-
IPS	• 인터넷 웜, 악성코드 및 해킹 등과 같은 유해 트래픽 차단	-
웹 방화벽	• 80, 443포트로 유입되는 웹 해킹 패턴 차단	-
Repository Firewall	• **위험 및 의심스러운 오픈소스 라이브러리 다운로드 격리**	**허용 혹은 격리**

(예) 지극히 정상적인 라이브러리 다운로드 트래픽(공격패턴 등이 전혀없다. !!)
https://www.test.com/repository/demo-mvn-proxy/com/thoughtworks/qdox/qdox/2.0-M8/qdox-2.0-M8.jar

Repository Firewall

✓ 저장소방화벽을 통한 Shift Left 모델



https://www.bmc.com/blogs/what-is-shift-left-shift-left-testing-explained/

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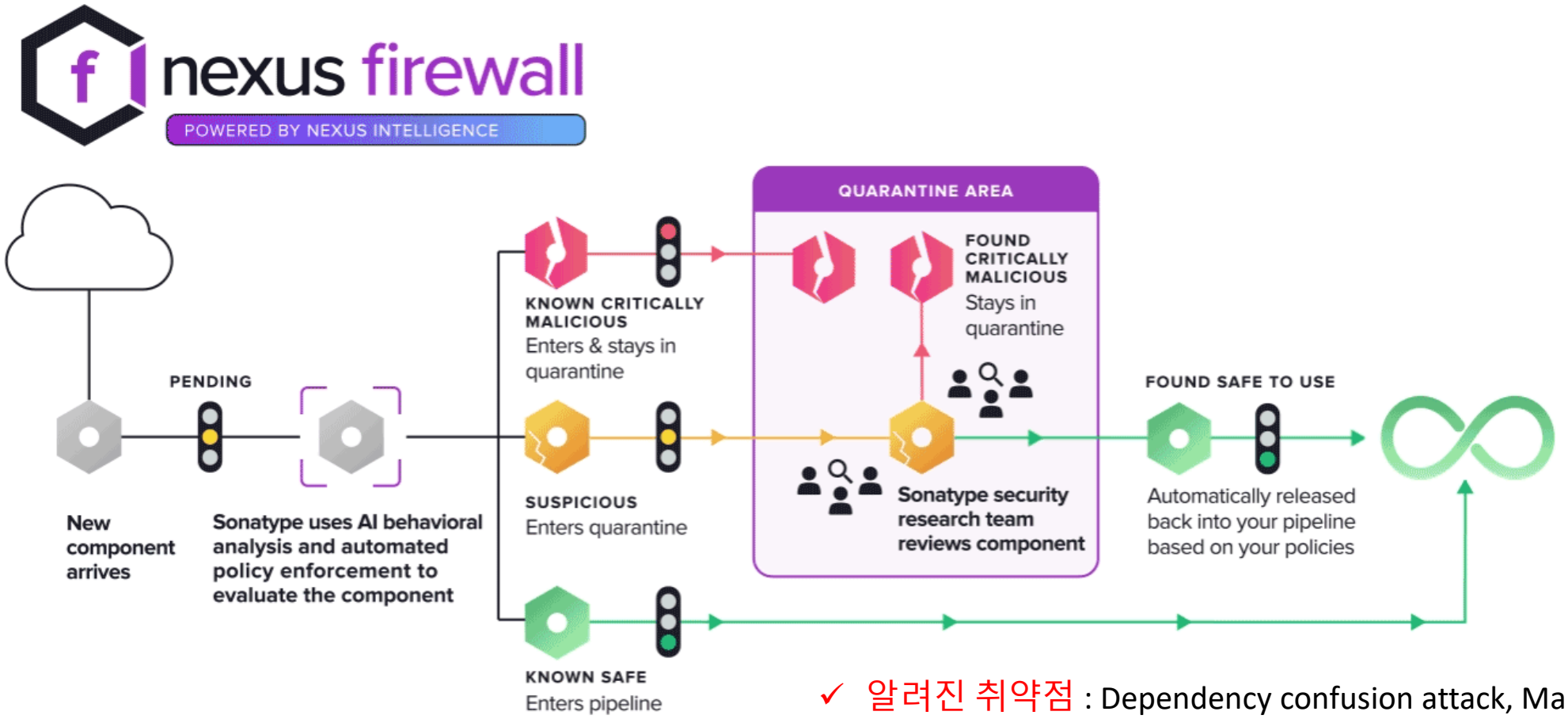
Repository Firewall

✓ 라이브러리 저장소 방화벽은 **외부에서 다운로드하는 위험/의심스러운 라이브러리를 격리(유입방지)**



✓ 알려진 취약점 : Dependency confusion attack, Malware 등

✓ 의심스런 취약점 : Pending/Suspicious integrity rating

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Repository Firewall

✓ proxy타입의 저장소(외부인터넷과 연결된)에 보호정책제공(악의적인 라이브러리 유입 "**격리/허용**")

✓ Repository Firewall 정책

	NAME	PROXY	DEVEL...	SOURCE	BUILD	STAGE	RELEASE	OPERA...	
Local to Root Organization									
10	Security-Namespace Conflict	Fail	—	—	—	—	—	—	›
10	Security-Malicious	Fail	Fail	Fail	Fail	Fail	Fail	Fail	›
10	Security-Critical	—	—	—	—	—	—	—	›
10	License-Banned	—	—	—	—	—	—	—	›
9	Security-High	—	—	—	—	—	—	—	›
9	License-None	—	—	—	—	—	—	—	›
9	Integrity-Rating	Fail	—	—	—	—	—	—	›
8	License-Copyleft	—	—	—	—	—	—	—	›
7	Security-Medium	—	—	—	—	—	—	—	›

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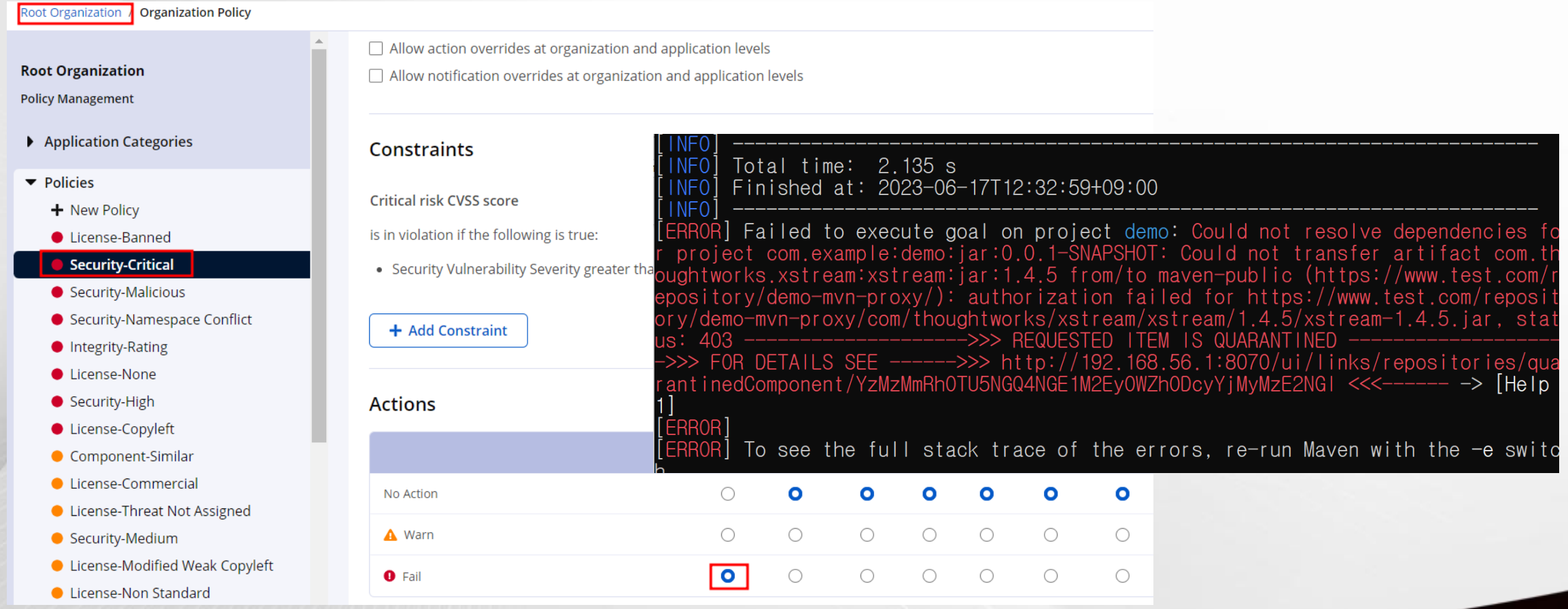
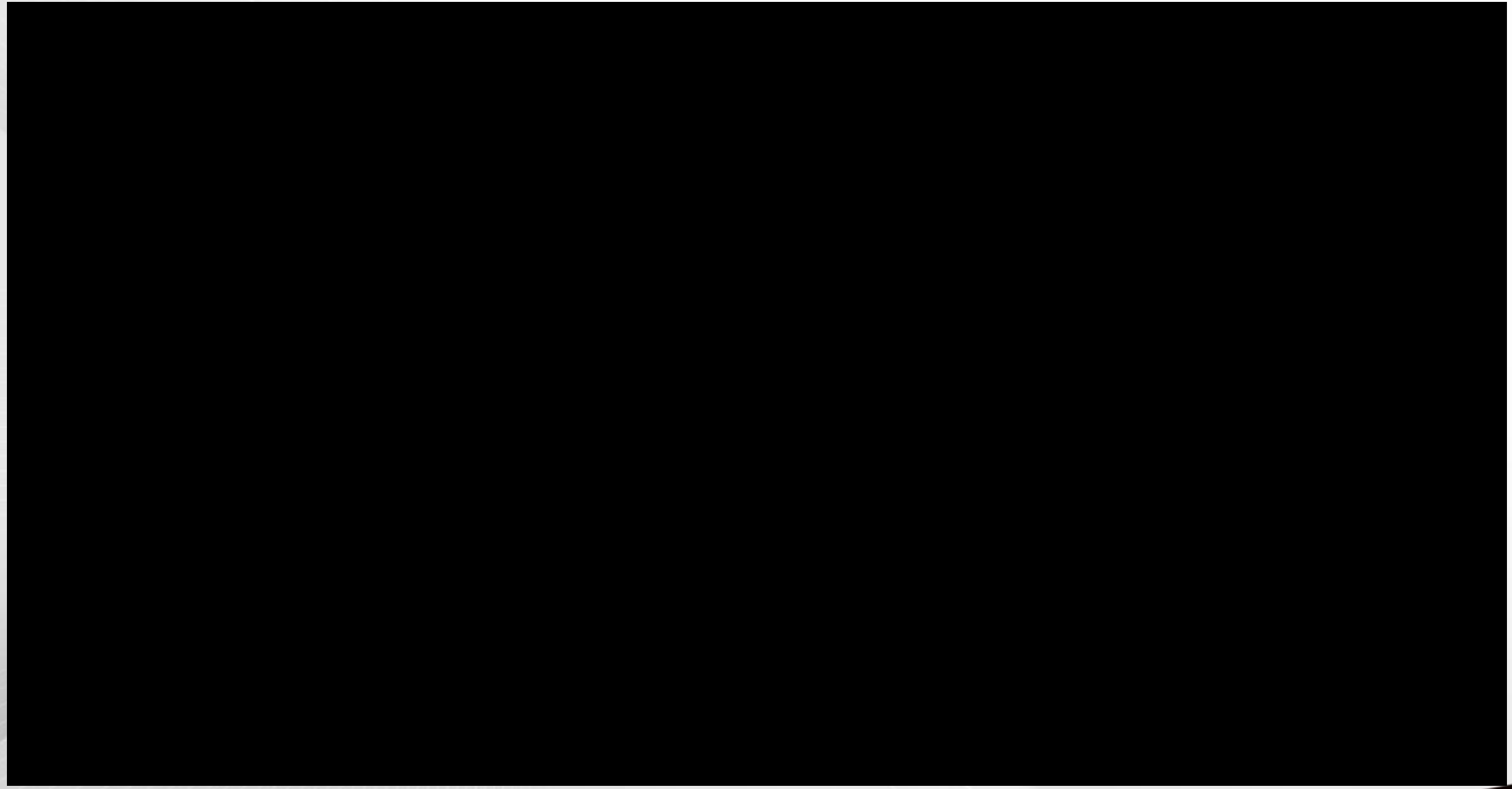
데모 – 저장소 방화벽

✓ 위험도 Critical 로 판단되는 라이브러리 유입차단을 설정한 경우, 다운로드를 시도한 개발자에게는 403(Fobidden)메세지를 통해 차단됨을 확인





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감사합니다.