# Module 7: Assignment: Secure Software Supply Chain with SBOMs

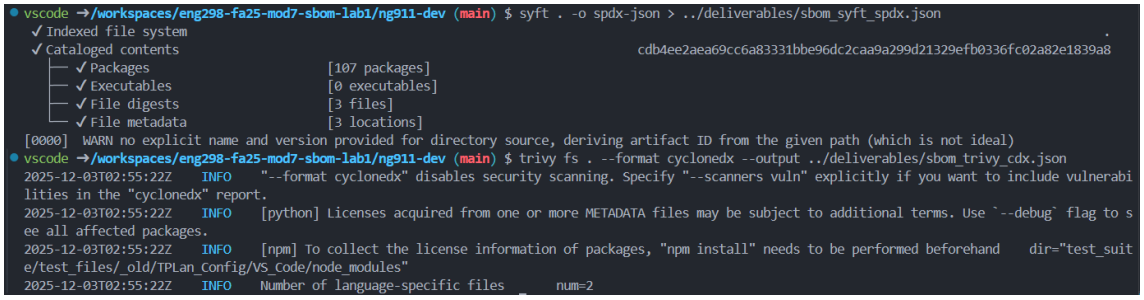
This assignment consists of the generation of SBOM (Software Bill of Materials), a detailed list of components that make up a software, and vulnerability analysis based on the generated SBOM. The software assed for vulnerabilities will be the NG911 repository, an application aligned with Next Generation 9-1-1 standards.

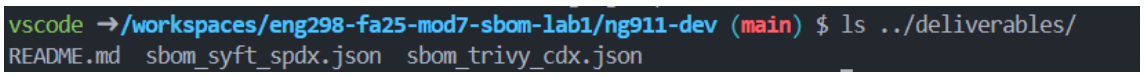
## Part 1: SBOM Generation (in Codespaces)

This part consists of the generation of SBOM using two different tools: Syft and Trivy.

Syft is an SBOM generator that analyzes the project's files and identifies all software packages, producing an SBOM in the SPDX format. On the other hand, Trivy is a multifunction security scanner that can also generate SBOMs.

Using both tools allows comparison between formats and demonstrates how different scanners identify components in slightly different ways.




Component count between tools

| | |
|---|---|
| Syft | **108** |
| Trivy | **106** |

I noticed that Syft's SPDX SBOM identified more components than Trivy's CycloneDX SBOM. This is likely due to SPDX capturing more metadata, while CycloneDX prioritizes higher-level application dependencies.

**Part 2: SBOM Vulnerability Analysis**

In this part, we use Grype to scan the SBOM produced by Syft for known vulnerabilities. Grype is an open-source vulnerability scanner that checks each component against public databases of CVEs (Common Vulnerabilities and Exposures), which are standardized identifiers for publicly disclosed security flaws.

This allows us to determine whether any dependencies in the NG911 software contain known weaknesses.

```
vscode ➜/workspaces/eng298-fa25-mod7-sbom-lab1/ng911-dev (main) $ grype sbom:../deliverables/sbom_syft_spdx.json -o table > ../deliverables/vuln_analysis_gr
ype.txt
 ✓ Vulnerability DB                [updated]
 ✓ Scanned for vulnerabilities     [9 vulnerability matches]
   ├── by severity: 0 critical, 2 high, 6 medium, 1 low, 0 negligible
```

Vulnerabilities found using Grype:

```
vscode ➜/workspaces/eng298-fa25-mod7-sbom-lab1/ng911-dev (main) $ head -20 ../deliverables/vuln_analysis_grype.txt
NAME          INSTALLED  FIXED IN  TYPE    VULNERABILITY        SEVERITY  EPSS           RISK
cryptography  43.0.0     44.0.1    python  GHSA-79v4-65xg-pq4g  Low       1.1% (77th)    0.3
setuptools    72.1.0     78.1.1    python  GHSA-5rjg-fvgr-3xxf  High      < 0.1% (25th)  < 0.1
fonttools     4.57.0     4.60.2    python  GHSA-768j-98cg-p3fv  Medium    < 0.1% (26th)  < 0.1
requests      2.32.3     2.32.4    python  GHSA-9hjg-9r4m-mvj7  Medium    < 0.1% (25th)  < 0.1
brotli        1.1.0      1.2.0     python  GHSA-2qfp-q593-8484  High      < 0.1% (3rd)   < 0.1
urllib3       2.2.2      2.5.0     python  GHSA-pq67-6m6q-mj2v  Medium    < 0.1% (2nd)   < 0.1
urllib3       2.2.2      2.5.0     python  GHSA-48p4-8xcf-vxj5  Medium    < 0.1% (0th)   < 0.1
cryptography  43.0.0     43.0.1    python  GHSA-h4gh-qq45-vh27  Medium    N/A            N/A
scapy         2.5.0                python  GHSA-cq46-m9x9-j8w2  Medium    N/A            N/A
```

*Top 5 CVEs found*

| CVE / GHSA | Severity | Component | Installed Version | Comment |
|---|---|---|---|---|
| GHSA-5rjg-fvgr-3xxf | High | setuptools | 72.1.0 | setuptools has a path traversal vulnerability in PackageIndex.download |
| GHSA-2qfp-q593-8484 | High | brotli | 1.1.0 | Scrapy is vulnerable to a denial of service (DoS) |
| GHSA-768j-98cg-p3fv | Medium | fonttools | 4.57.0 | fontTools is Vulnerable to Arbitrary File Write |
| GHSA-9hjg-9r4m-mvj7 | Medium | requests | 2.32.3 | Requests vulnerable to .netrc credentials leak via malicious URLs |
| GHSA-pq67-6m6q-mj2v | Medium | urllib3 | 2.2.2 | urllib3 redirects are not disabled |

**CVE GHSA-5rjg-fvgr-3xxf**

This vulnerability is caused by insufficient sanitization of filenames in PackageIndex.download, allowing attackers to exploit path traversal and write files to arbitrary locations on the system, which can potentially lead to code execution.