sbom-cve-check: Lightweight Python tooling for out-of-build CVE analysis of SPDX3 SBOMs

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sbom-cve-check

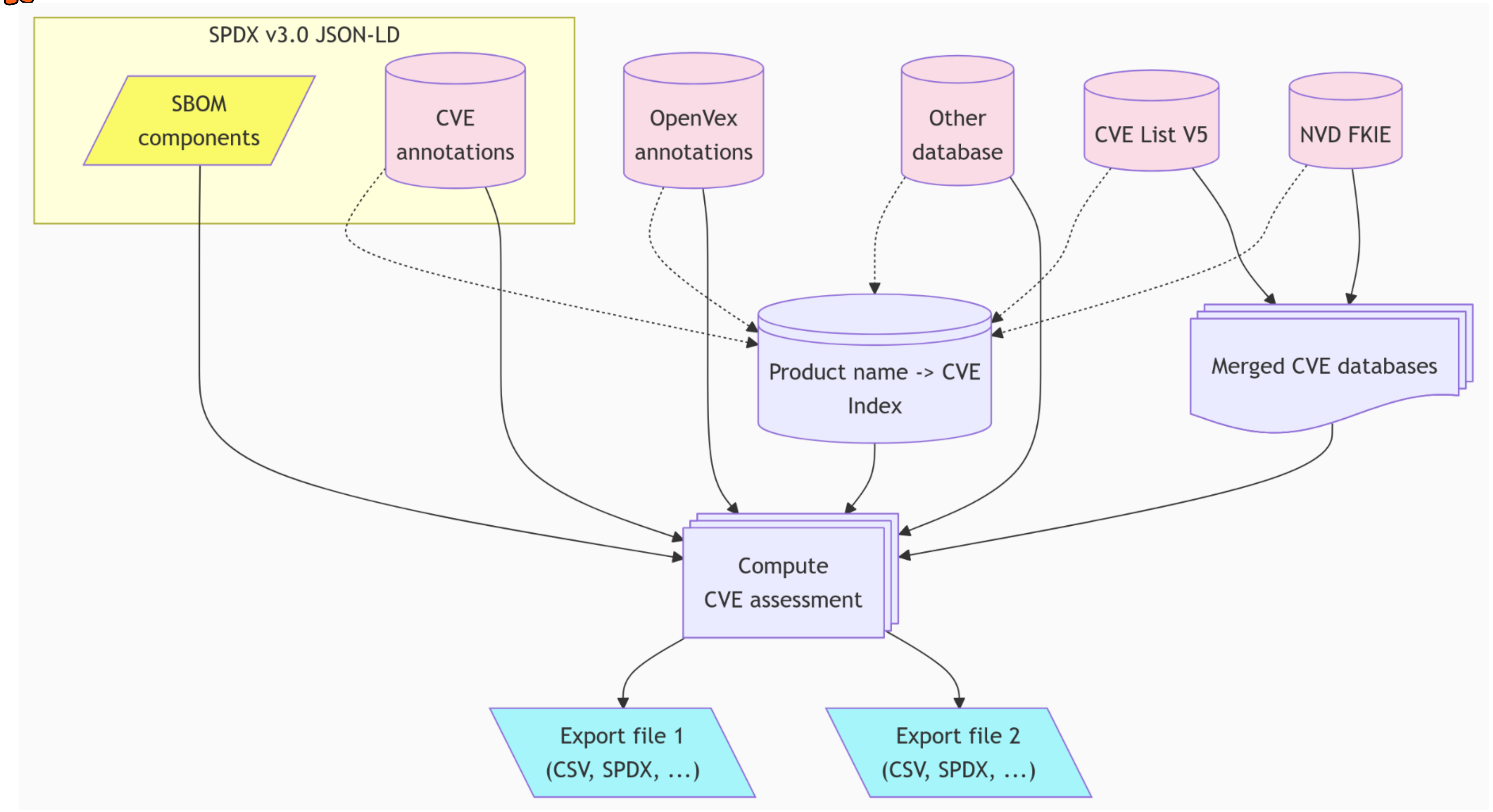
What is it?

- A **standalone** python tool, with as few dependencies as we could manage
- Takes as input:
  - an SBOM (currently SPDX 2.2 and SPDX 3.0 formats are supported)
  - (optional) the JSON VEX manifest generated by Yocto's `vex.bbclass` in upstream oe-core since Yocto 5.0.15 "Scarthgap", also in Walnascar and in Styhead.
  - some enrichment databases
- Looks up which CVEs impact the SBOM, and therefore potentially the systems
- Outputs vulnerability assessments in a format that can be fed to downstream tools
- Overall, close to Yocto's `cve-check.bbclass`

Why is it?

- Not being aware of which CVEs affect one's stuff is going to get expensive soon with the EU Cyber Resilience Act (CRA).
- `cve-check` is great, but runs **during a build** of Yocto. This is inconvenient because:
  - CVE checking already takes a while, no need to add build time to it
  - once the software is shipped, building an old version might be unnecessary effort
  - what if we wanted to check artifacts of a build we did not/cannot run?
- There are very few, if any, analysis tools that support SPDX3.
- Easy
  - few dependencies
  - easy to install and use
  - no bells, no whistles

Overall design



Input & outputs formats

- The tool pulls from several CVE databases:
  - **NVD**, from `github.com/fkie-cad/nvd-json-data-feeds`
  - **CVE List**, from `github.com/CVEProject/cvelistV5`
- It supports multiple annotation formats:
  - OpenVEX
  - Yocto's custom format, generated from `vex.bbclass`
  - A simple annotations format stored in YAML files.
  - Annotations provided in SPDX 3.0 SBOM file.
- It supports the following export formats:
  - SPDX3: Only if the input SBOM is also an SPDX 3.0 file (for now).
  - CSV
  - Yocto's cve-check output format.

Features

- **sbom-cve-check** can be extended by using custom (external) plugins. This allows to add a new type or format that is not currently supported. For example:
  - A new type of SBOM format
  - A custom CVE annotation format
  - A custom report (export) format (Web page, PDF, ...)
- Mark a CVE automatically as ignored if affected sources are not compiled.
  - Require to set `SPDX_INCLUDE_COMPILED_SOURCES` to `1` in each recipe that need this extra processing.
  - The CVE database needs to provide the list of affected files: Most of the Linux kernel CVEs have this information.

Sources & documentation

- The source code is available here: `github.com/bootlin/sbom-cve-check`
  - The source code is under GPLv2
  - Contributions are of course welcome :)
- The documentation can be consulted from: `sbom-cve-check.readthedocs.io`

Want to try it out?

- Install the tool:
  - Create a Python virtual environment (recommended)
  - `pip install sbom-cve-check[extra]`
- Generate artifacts using Yocto (or use existing ones):
  - SPDX v3.0 is generated by default since Yocto Walnascar (5.2).
  - Add `INHERIT += "vex"` in `local.conf`.
- Retrieve these artifacts from Yocto `deploy` directory:
  - `${IMAGE_NAME}.rootfs.spdx.json`: The SPDX v3.0 SBOM file.
  - `${IMAGE_NAME}.rootfs.json`: File generated by the `vex.bbclass`.
- Execute:

```
sbom-cve-check --sbom-path ${IMAGE_NAME}.rootfs.spdx.json \
  --yocto-vex-manifest ${IMAGE_NAME}.rootfs.json \
  --export-type yocto-cve-check-manifest --export-path out.json
```

Thank you!

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