Introduction to VulnerableCode
Q1 2023

Abstract

- Databases of known FOSS software vulnerabilities are mostly proprietary and/or privately maintained.
- **Why not open data? Open source likes open!**
- Find how we are working to build new FOSS tools to:
  - Aggregate and publish software component vulnerability data from multiple sources and
  - Automate the search for FOSS component security vulnerabilities.
  - With open code and open data.
- The benefit will be improved security of software applications with **open tools and open data for everyone**.

Agenda

- Software Supply Chain Security
- The Problem(s)
- The VulnerableCode Solution
- Demo
- Next Steps
- References

Software Supply Chain Security

- Obviously, a huge topic
- Linux Foundation / OSSF has identified 3 focus areas:
  - Securing OSS Production
  - **Improving Vulnerability Discovery & Remediation**
  - Shorten Ecosystem Patching Response Time
- nexB focus is on using SCA to
  identify software vulnerabilities, their impact and remediation

The Problem

- There is no open code AND open data **QUALITY** vulnerability DB
- Security vendors **DO NOT WANT TO SOLVE** the problem
- Race to the BIGGEST database of @#$!*
- Expensive **and** poor quality
- Existing "free" database are problematic with opaque review process

The Quality Problem

- DBs are making up packages that do not exist
  - No big deal, none uses them... but this shatters confidence
- DBs invent vulnerable ranges
- They do not agree on vulnerable ranges
- "Cry wolf" with dubious vulnerabilities
- Claim to have "secret" "premium" vulnerabilities
- Do not publish their findings upstream at the NVD to share back

Meanwhile at Security (1)

What I would hope for: a tidy and organized security gate

Credit: https://www.flickr.com/photos/oddharmonic/4756905580 " oddharmonic Security at Denver International Airport
License: CC-BY-2.0 https://creativecommons.org/licenses/by/2.0/

Meanwhile at Security (2)

The reality:

Credit: Arne Müseler http://arne-mueseler.com/ https://commons.wikimedia.org/wiki/File:Loveparade_2010_duisburg_tunnel_ramp.jpg

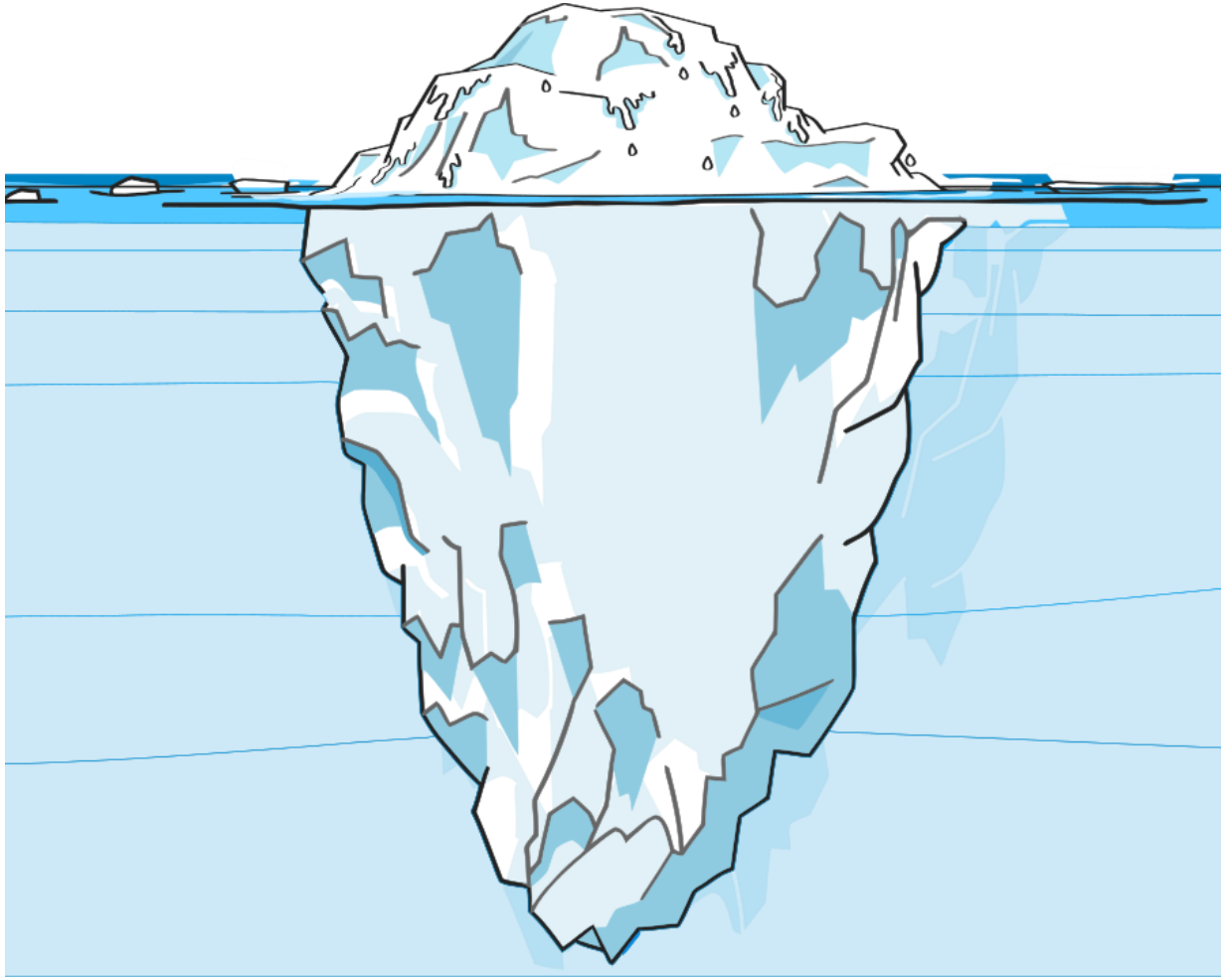
License: CC-BY-SA-3.0 https://en.wikipedia.org/wiki/en:Creative_Commons
From https://en.wikipedia.org/wiki/Love_Parade_disaster
On 24 July 2010, a crowd disaster at the 2010 Love Parade electronic dance music festival in Duisburg, North Rhine-Westphalia, Germany, caused the deaths of 21 people from suffocation as attendees sought to escape a ramp leading to the festival area.[1] 652 people were injured.

Our Solution

VulnerableCode DB with GUI, API and Vulntotal

An below the water line:

- Many data sources
- Import from upstream!
- PURL, package first!
- Cleaned, combined and merged
- All data licenses are tracked
- Smart vulnerable version ranges (Also used in OSV)
- Bots to improve the data



Credits: MoteOo https://pixabay.com/illustrations/iceberg-above-water-white-cold-3273216/ and openclipart by https://www.openclipart.org/detail/299871/tip-of-the-iceberg
License: https://scancode-licensedb.aboutcode.org/pixabay-content.html

Can you prove this is better?

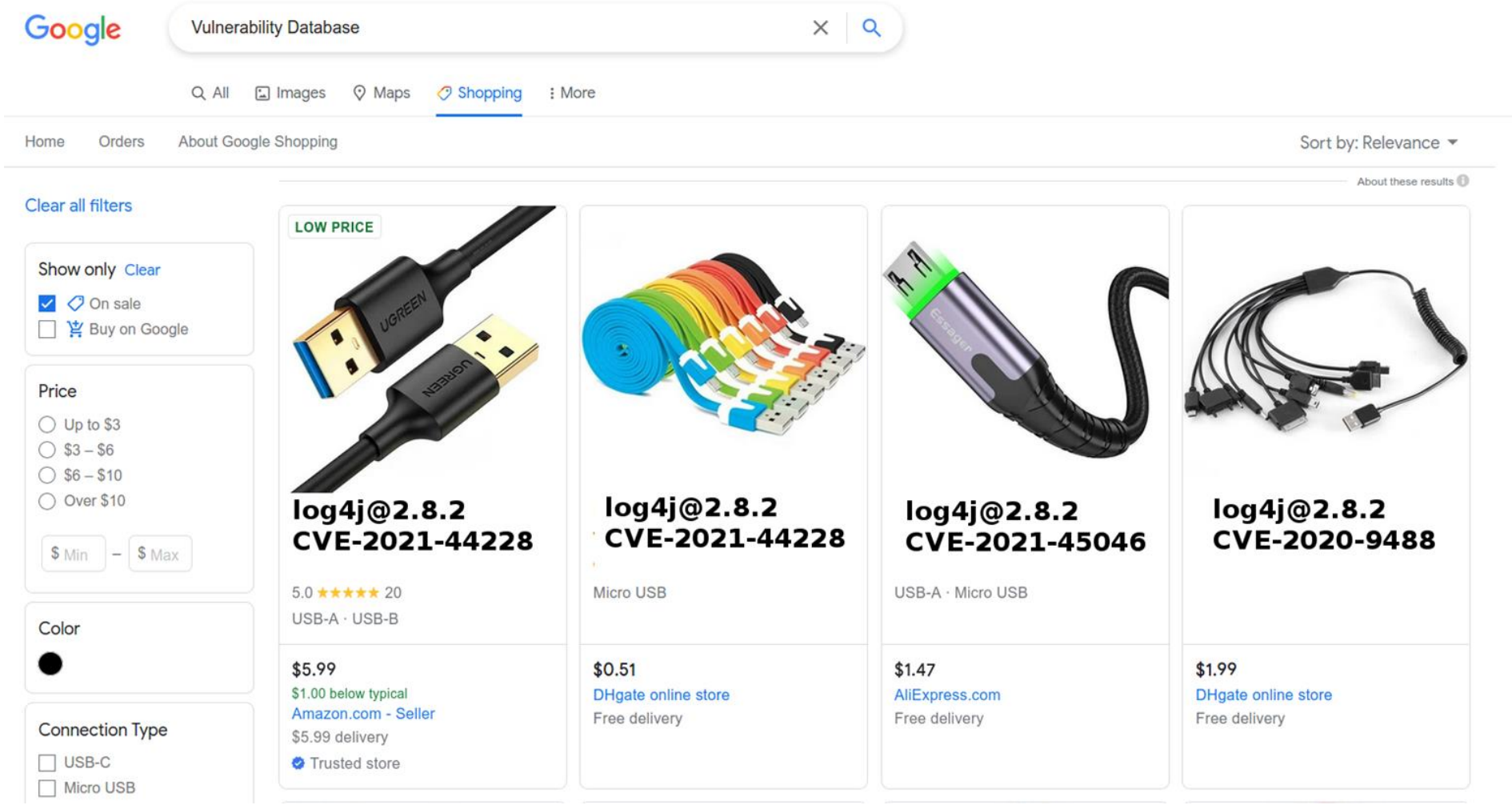
W. Edwards Deming said:

nexB

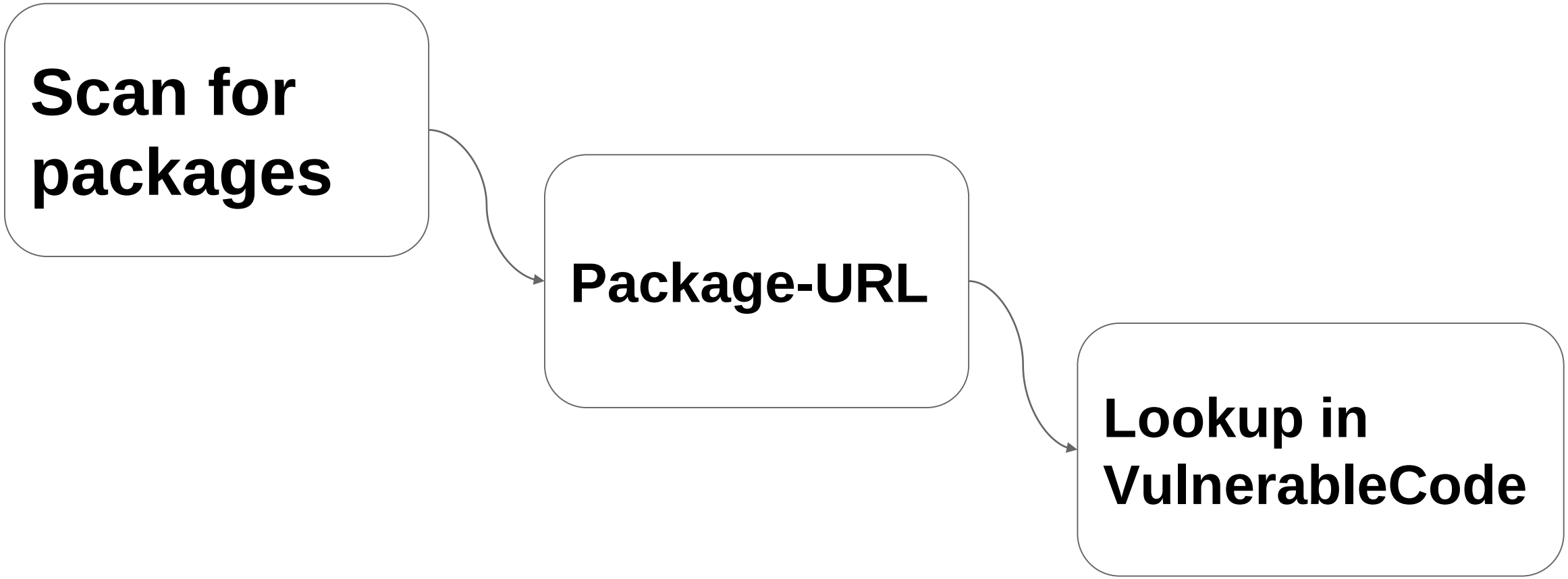
"In God we trust. All others must bring data."

VulnTotal: Comparison shopping for VDB

- By VulnerableCode team member, Keshav Priyadarshi



The workflow



VulnerableCode.io Demo

- Packages
  - Affected by
  - Fixing
- Vulnerabilities
- VulnTotal

Package URL aka. PURL

- I created Package URL for VulnerableCode and ScanCode

The critical GLUE between all the software supply chain tools

- Package URL project: https://github.com/package-url
  - Spec is at: https://github.com/package-url/purl-spec
  - Implementations for .NET, Go, Java, JavaScript, PHP, Python, Ruby and Rust
- Recent proposal to add purl to NVD:
  - https://owasp.org/blog/2022/09/13/sbom-forum-recommends-improvements-to-nvd.html

But wait!

- If I alone control this data, I am adopting the same flawed ways as others before us.
- We need to make this a **shared resource for everyone**, that's under the shared control of EVERYONE
- **You can already self-host VulnerableCode**
- **Working next on a new way to federate and decentralize this**

Next steps

- Collect the **fix commits** for call graph or dynamic analysis
- Design an **Advisory clarity score** and of their providers
- Make VulnTotal work as a browser extension with zero install
- **More, smarter improvers**
  - Check if package exists, validate all ranges are correct
  - Mine the graph to establish correlations
- Natural language parsing of vulnerability descriptions and advisories
- Extract unpublished vulnerabilities from commit histories and trackers
- **Federated and crowdsourced** vulnerability curation
- **NVDR:** Universal non-vulnerable dependency resolvers

NVDR: keep the barbarians at the gate!

- By VulnerableCode maintainer, Tushar Goel
- If you could blend
  - **Functional dependency constraints**
  - **Known vulnerable ranges**
- And inject these in a package dependency resolver
- You get

Non Vulnerable Dependency Resolution!

- Working PoC implemented in **python-inspector** tool and paper https://www.tdcommons.org/dpubs_series/5224/

Sustainability

- Help us make this work for everyone and for YOU

  You MUST fund this project to build security commons

- We received grants from the European Union through the NGI-0 program and NLnet

  Contact me at pombredanne@nexb.com

References

- VulnerableCode
- ScanCode
- Package-URL (purl)
- AboutCode

VulnerableCode

- Collect and aggregate vulnerability data from many public sources
  - Projects, GitHub, Linux Distros, NVD, Package managers and others
  - Focus on upstream projects (source of the source)
- Apply confidence-based system
  - not all data are equally trusted and of equivalent quality
- Find anomalies using correlations and comparisons
- Discover relations between vulnerabilities and packages from mining the graph
- Public.VulnerableCode.io database
- See https://nexb.com/vulnerablecode/ for more information

Package-URL

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  - Spec is at: https://github.com/package-url/purl-spec
  - Implementations for .NET, Go, Java, JavaScript, PHP, Python, Ruby and Rust
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ScanCode

- Identify FOSS and other third-party components & packages
- Detect licenses, copyrights and dependencies
- ScanCode Projects include:
  - ScanCode.io: Server system with customizable pipelines
  - ScanCode Toolkit: Scanning engine - use as CLI or library
  - LicenseDB: 2000+ licenses detected by ScanCode
  - ScanCode Workbench: Desktop app to review Scans
- See https://nexb.com/scancode/ for more information

AboutCode

- AboutCode is a virtual org for our collection of FOSS SCA tools
  - Also, the home for our GSoC projects
  - And we are on OpenCollective at: https://opencollective.com/aboutcode
- Our projects are at: https://github.com/nexB
- Documentation for each project is at ReadTheDocs.org
- AboutCode home: https://www.aboutcode.org/

Credits

Special thanks to all the people who made and released these excellent free resources:

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