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The Lessons of Log4shell

Preparing for the Next Zero-Day

Hello World

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Agenda

00 The Silver Bullet

01 Lesson 1

02 Lesson 2

03 Lesson 3

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This is not a utopian talk with magic solutions

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Lesson 1:
The Bad News

Home / Risk Management

With 40% of Log4j Downloads Still Vulnerable, Security Retrofitting Needs to B… Full-Time Job

Log4j flaw: Why it will still be causing problems a decade from now

Log4Shell ain't over until it's over, warns the US review board tasked with investigating the critical Apache Log4J flaw known as Log4Shell.

Written by Liam Tung, Contributing Writer on July 15, 2022

Mark Chmarny (He/Him) • Following
Product, Infra & DevEx at Cruise
4mo •

29% of Log4j consumption worldwide STILL uses versions that are known to be vulnerable (source: Sonatype)


WE ARE NEVER EVER EVER
GETTING RID OF LOG4SHELL
quickmeme.com

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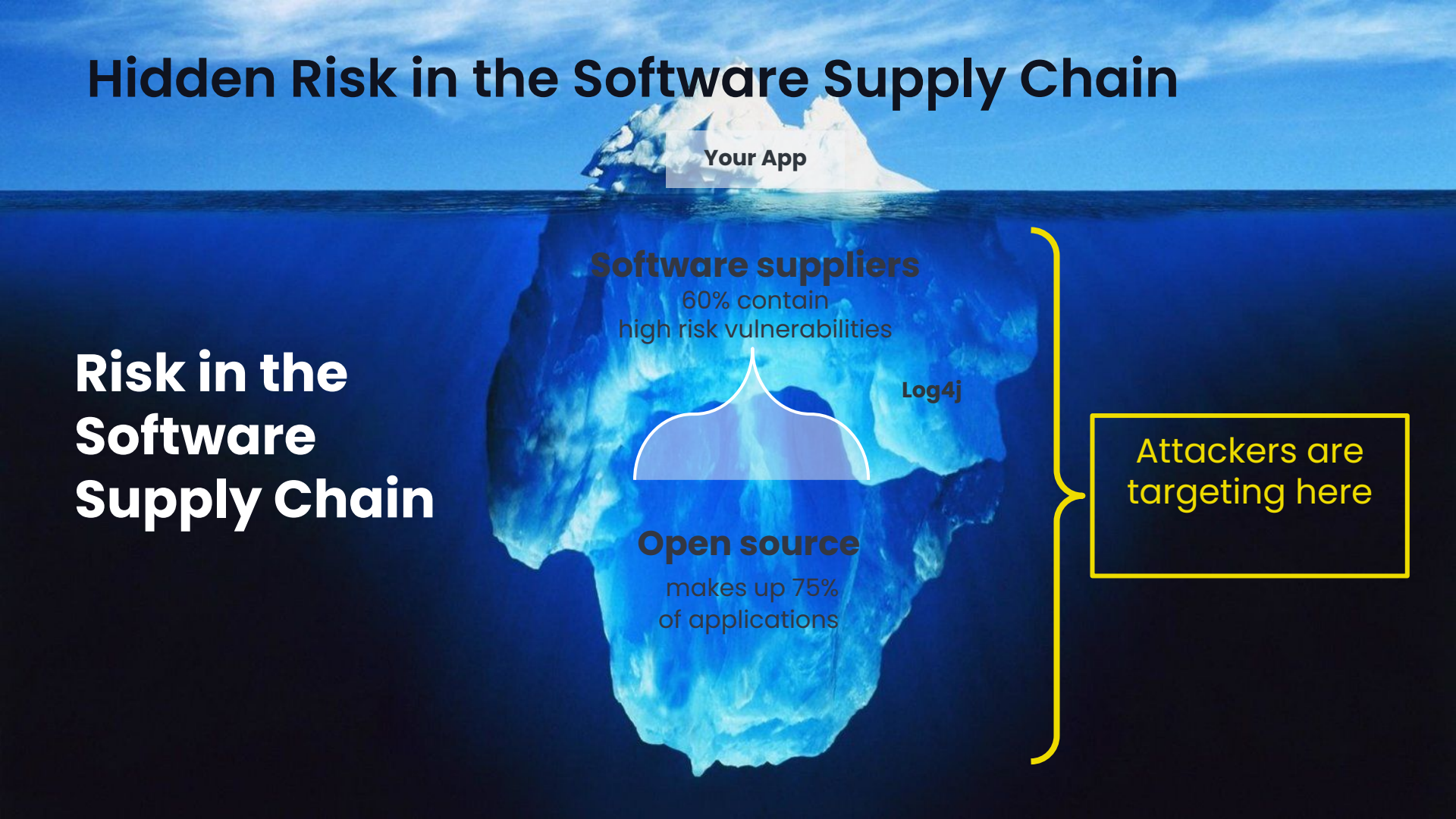
Lesson 2:
What We Don’t Know

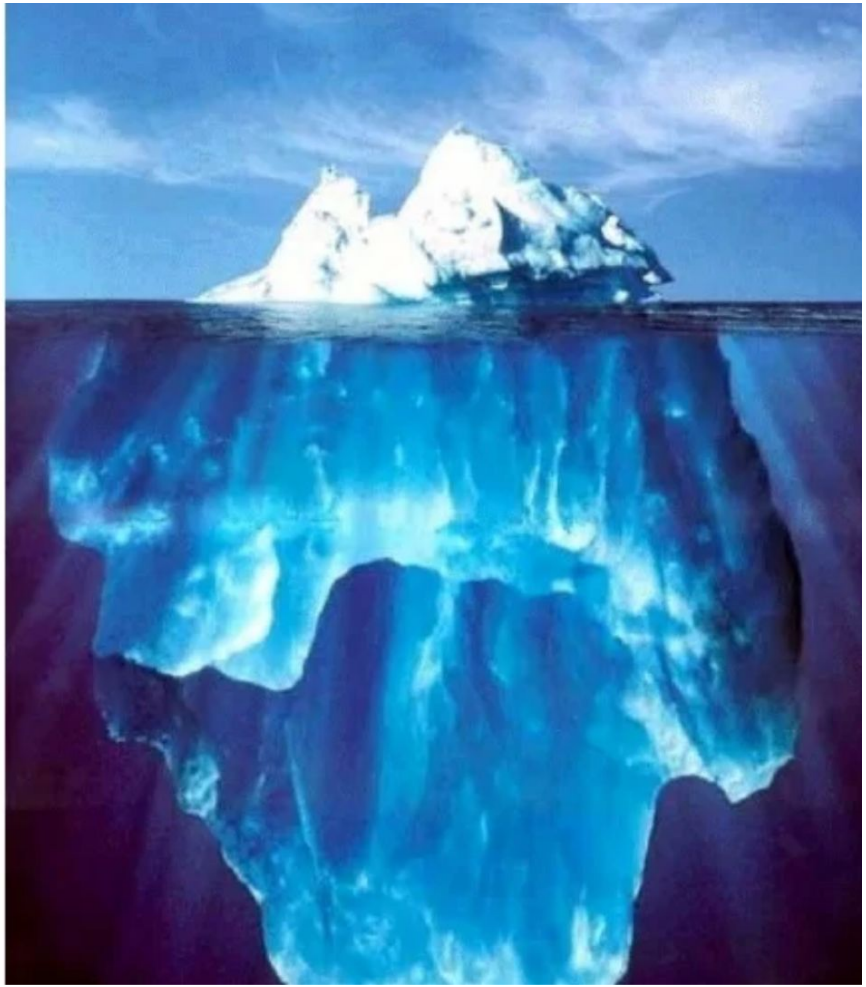
Hidden Risk in the Software Supply Chain

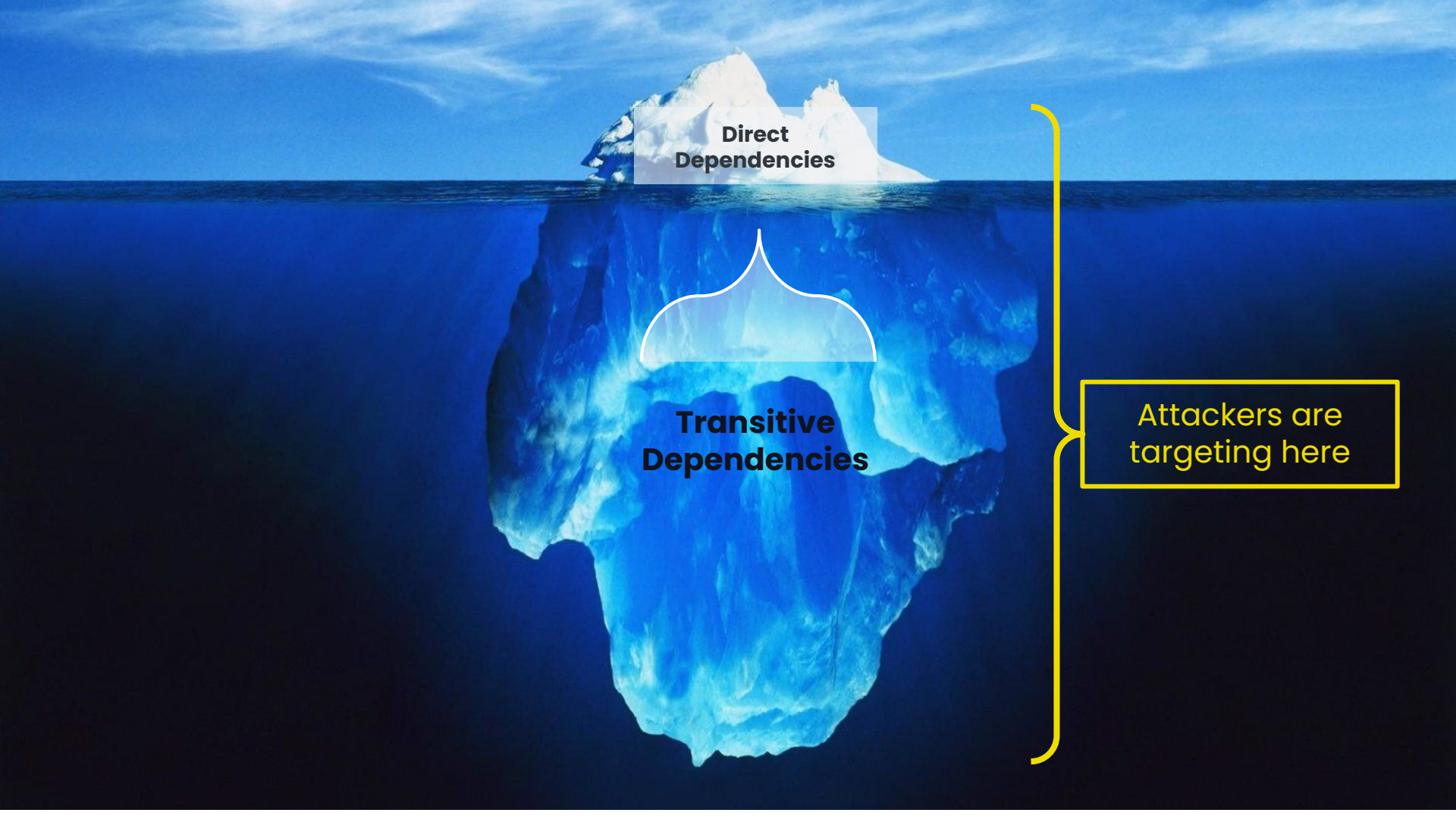


Risk in the Software Supply Chain

Free is Just the Tip of the Iceberg: Open Source Library System Software

Lori Bowen Ayre
lori.ayre@galecia.com
METRO Webinar
October 6, 2009




Direct
Dependencies
Transitive
Dependencies
Attackers are
targeting here

This metaphor...

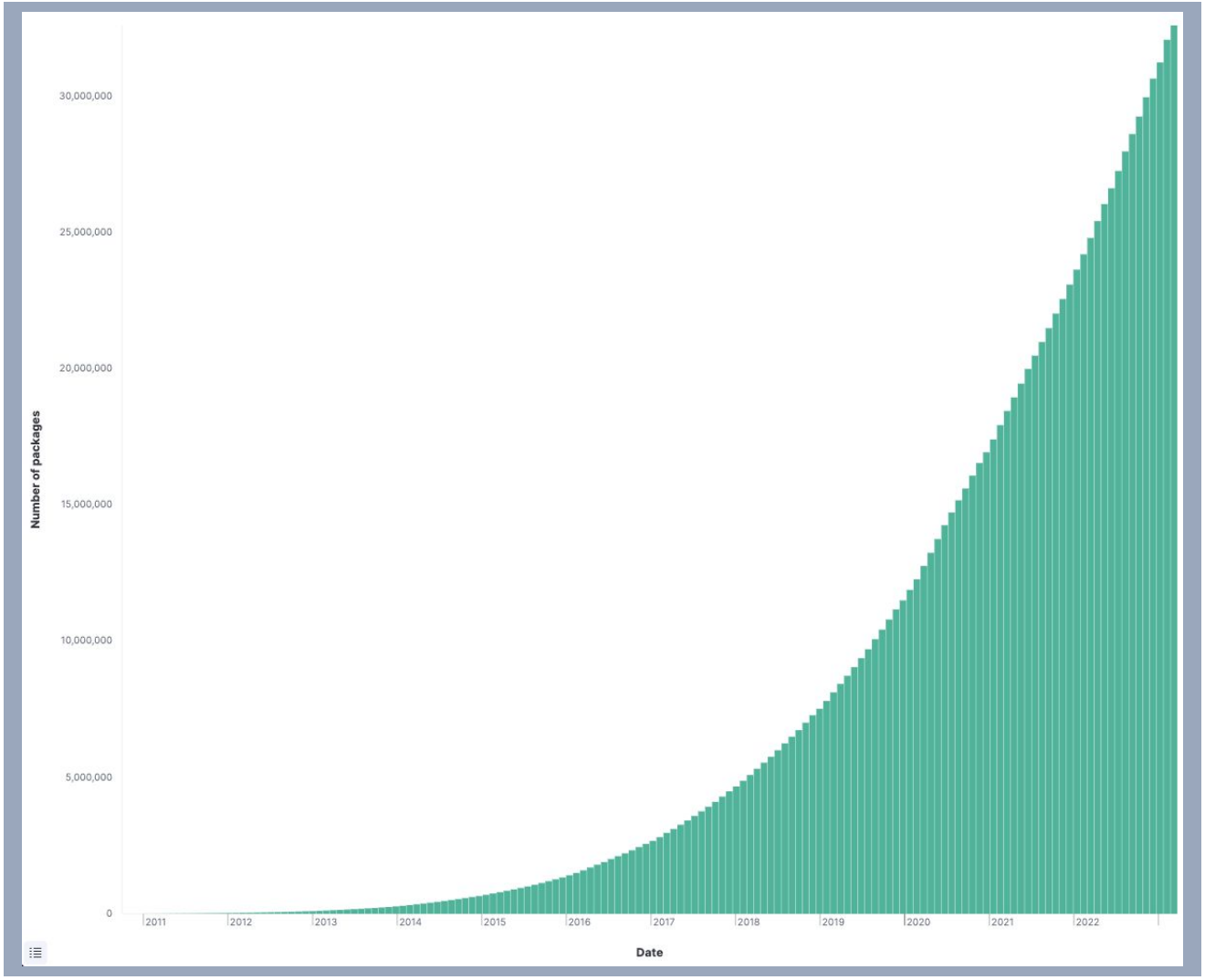
- You've seen this iceberg metaphor. I've used this metaphor 100 times, I've criticized this metaphor.
- This is an OLD metaphor
- Things have changed a lot but we're still thinking about old systems
- https://www.slideshare.net/loriayre/open-source-library-system-software-free-is-just-the-tip-of-the-iceberg
- They're attacking the bottom now - that's a supply chain attack
- But really, the top isn't "your code" - the top is your direct dependencies, bottom is transitive
- You can only directly control what's at the top
- They're attacking the whole iceberg, but you probably only know about the stuff at the top

WHY Don’t We Know?

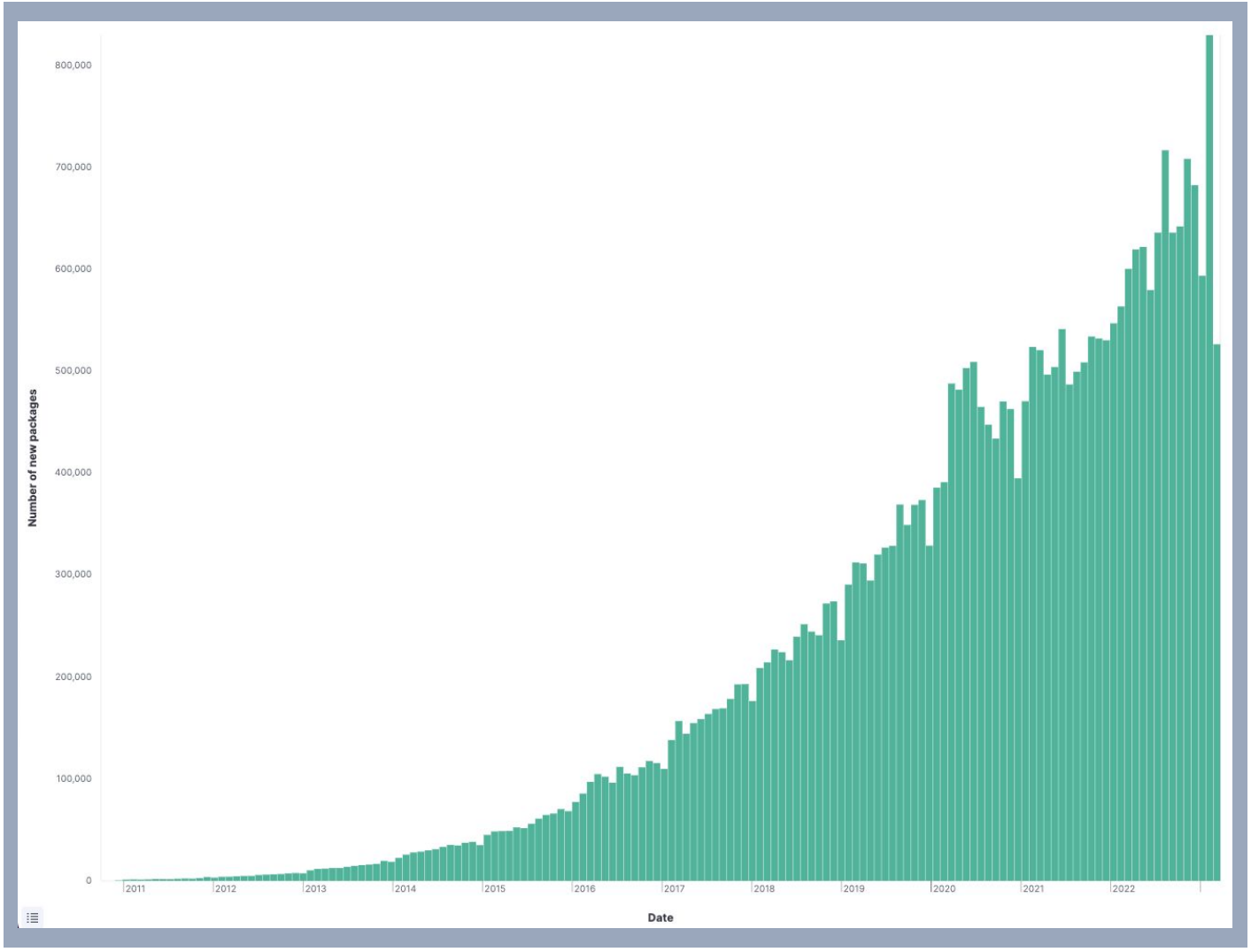
- Explosion of Open Source
- Transitive Dependencies

The Result:

Number of
NPM packages



Number of
NEW packages

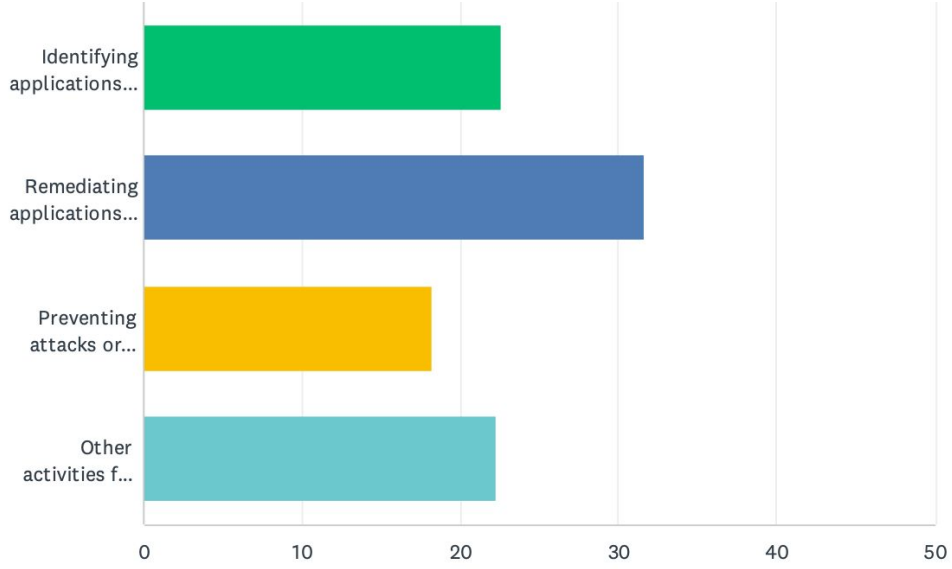


Open source is huge

- NPM introduced 2010
- 32 million packages (as of March 2023)
- Approx. 1,000,000 new packages **per month**
- That’s just NPM!

Q12 Estimate how many hours you personally have spent to date on each of the following activities.

Answered: 195 Skipped: 15

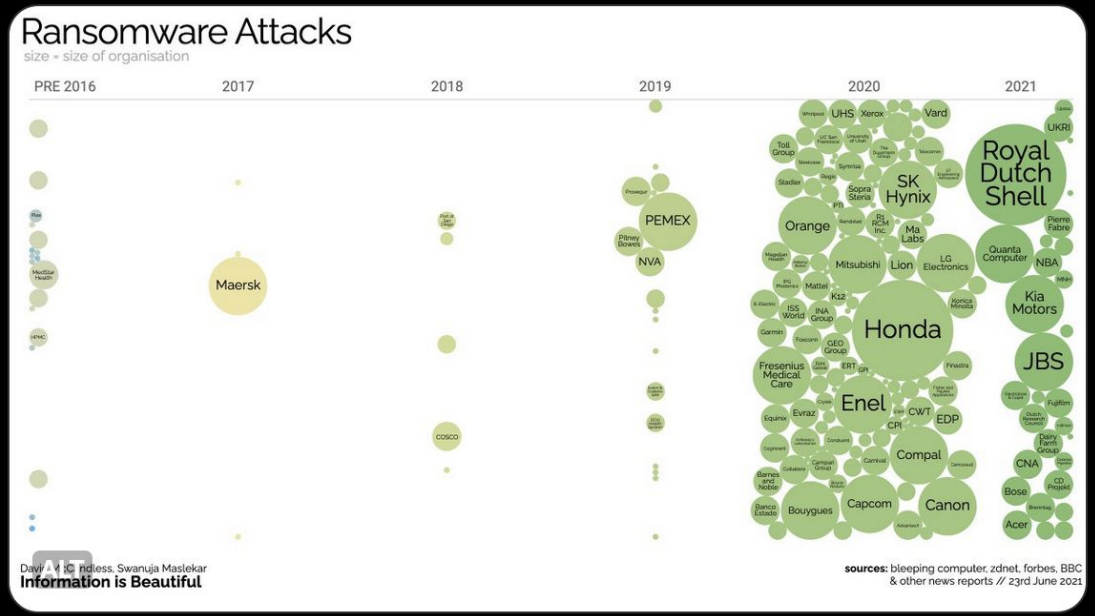


If We Knew…

- People spent insane amounts of time just finding log4j, because nobody knew where (or even if) it was hiding
- Knowing = Faster Remediation
- SBOMs help, a LOT, but…
  - They aren't a silver bullet
  - Scanners aren't perfect (e.g. can't penetrate binary blobs, cf. OpenSSL3.)
  - Not all SBOMs are equal
  - SBOMs aren't ubiquitous (yet) (producers aren't reliably supplying them)
  - SBOMs are more accurate and useful when producers/maintainers generate them BUT something is better than nothing
  - SBOM management is hard
  - Any SBOM generated before an actual build is suspect (transitive deps)
  - SBOM Everywhere: https://github.com/ossf/sbom-everywhere
  - I don't know what the end game is but generating them is better than nothing, figure out the details later

Information is Beautiful
@infobeautiful

Are #Ransomware attacks increasing? I think #Ransomware attacks are increasing...
interactive: bit.ly/3h1IYPs



11:33 AM · Jun 23, 2021

The predictable consequence

- Ransomware has exploded along with transitive dependencies and open source in general
- I don’t believe in coincidences

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Lesson 3: The Other Thing We Don’t Know

Paul Novarese (He/Him) • You
Software Supply Chain Security at Anchore
1yr • Edited •

The #log4j debacle is going to have ramifications far beyond the vulnerability itself. There has been a lot of inertia in how issues are evaluated and classified, how information about those issues is disseminated, and how organizations respond to them, and #log4shell has exposed a lot of these problems. This will be a catalyst for a lot of changes that are way overdue.

April King
@CubicleApril

The fact that there are almost 10,000 CVEs with the same CVSS score as the Log4j vulnerability suggests to me that maybe the scale should be logarithmic.

6:26 PM · Dec 11, 2021 · Twitter for iPhone

71 Retweets **6** Quote Tweets **736** Likes

OK, If Not CVSS, Then What?

- GHSAs (more transparent than CVEs)
- CISA KEV
- EPSS
- GitHub Insights and other project health metrics
  - This is (currently) a very manual process
  - But it's getting a lot easier
  - Project health isn't **directly** about safety
  - What happens when it hits the fan?

An Example Project Health Metric:

Number of Maintainers

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Recap, Notes, &c.

Recap

- Log4Shell is Radioactive, Immortal
- We Don’t Know What’s In Our Own Software
- We Must Get Better Guidance
- How Software Gets Made is Different Now
- We Have a Lot of Eggs in GitHub’s Basket
- Think about Risk in the General Case

Footnotes

Slide 6 (Log4Shell will still be causing problems a decade from now):
https://www.zdnet.com/article/log4j-flaw-why-it-will-still-be-causing-problems-a-decade-from-now/

Slide 6 (40% of Log4j downloads still vulnerable):
https://securityintelligence.com/articles/log4j-downloads-vulnerable/

Slide 10 (possible origin of the iceberg):
https://www.slideshare.net/loriayre/open-source-library-system-software-free-is-just-the-tip-of-the-iceberg

Slides 12,13, 22 (Open Source is Bigger Than You Can Imagine):
https://anchore.com/blog/open-source-is-bigger-than-you-imagine/

Slide 14 (log4j survey etc):
https://anchore.com/log4j/

Slide 18:
https://twitter.com/CubicleApril/status/1469825942684160004
https://www.linkedin.com/posts/novarese_log4j-log4shell-activity-6876206319238463488-8bEA

Reading List

GitHub Advisory Database:
https://github.com/advisories

GitHub Insights:
https://docs.github.com/en/issues/planning-and-tracking-with-projects/viewing-insights-from-your-project/about-insights-for-projects

CVEs CWEs CVSS and It's Discontents
https://www.linkedin.com/pulse/cves-cwes-cvss-its-discontents-sherif-mansour

Open Source Security Podcast Episode 392 – Curl and the calamity of CVE
https://opensourcesecurity.io/2023/09/10/episode-392-curl-and-the-calamity-of-cve/

My previous DevOpsDays 2022 talk (Learn From Log4Shell):
https://www.youtube.com/watch?v=PINtIL_oN0k
https://github.com/pvnovarese/2022-devopsdays

Probably Don't Rely on EPSS Yet
https://insights.sei.cmu.edu/blog/probably-dont-rely-on-epss-yet/

CVE-2020-19909 is everything that is wrong with CVEs
https://daniel.haxx.se/blog/2023/08/26/cve-2020-19909-is-everything-that-is-wrong-with-cves/

CISA Known Exploited Vulnerability Catalog
https://www.cisa.gov/known-exploited-vulnerabilities-catalog

Exploit Prediction Scoring System
https://www.first.org/epss/

Do SBOMS Need VEX?
https://www.linkedin.com/posts/aph10_sbom-softwaresupplychainsecurity-vex-activity-7108017924384137216-VARV/

Log4Shell Reading List

Dealing with log4shell (detection, mitigation, workarounds):
https://cloudsecurityalliance.org/blog/2021/12/14/dealing-with-log4shell-aka-cve-2021-44228-aka-the-log4j-version-2/

Keeping up with log4shell (post mortem)
https://cloudsecurityalliance.org/blog/2021/12/16/keeping-up-with-log4shell-aka-cve-2021-44228-aka-the-log4j-version-2/

Mysterious tweet hinting at the exploit:
https://twitter.com/sirifu4k1/status/1468951859381485573

Another mysterious tweet:
https://twitter.com/CattusGlavo/status/1469010118163374089

“THE” pull request:
https://github.com/apache/logging-log4j2/pull/608

Cloudflare digs for evidence of pre-disclosure exploits in the wild:
https://twitter.com/eastdakota/status/1469800951351427073

SBOM Takeaways

00 SBOMs enable continuous, automated security/compliance checks, reduce time spent identifying and remediating issues

01 SBOMs improve a lot of things but do not solve every problem you have

02 Log4j is extremely easy to find, OpenSSL 3 is often obscured

03 SBOMs are more effective when created by maintainers rather than consumers, but something is better than nothing

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SBOM Reading List

Making Better SBOMs: https://kccncna2022.sched.com/event/182GT/ – https://www.youtube.com/watch?v=earq775L4fc

Reflections on Trusting Trust: https://www.cs.cmu.edu/~rdriley/487/papers/Thompson_1984_ReflectionsonTrustingTrust.pdf

Generate sboms with syft and jenkins: https://www.youtube.com/watch?v=nMLveJ_TxAs

Profound Podcast - Episode 10 (John Willis and Josh Corman):
https://www.buzzsprout.com/1758599/8761108-profound-dr-deming-episode-10-josh-corman-captain-america

GitHub Self-Service SBOMs: https://github.blog/2023-03-28-introducing-self-service-sboms/

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Q&A

Download Syft

https://github.com/anchore/syft

Download Grype

https://github.com/anchore/grype

Let us know if you like it by giving us a star on GitHub

Get an invite to our open source community Slack at
https://anchore.com/slack/

These slides and lab examples archived here:

https://github.com/pvnovarese/2023-09-lessons-of-log4shell