



**Westfälische
Hochschule**

Gelsenkirchen Bocholt Recklinghausen
University of Applied Sciences

Our (in)Secure Web: Understanding Update Behavior of Websites and Its Impact on Security

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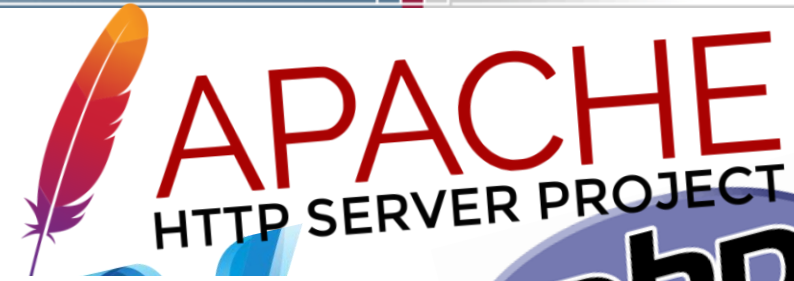
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Motivation

and many
3rd parties

Bootstrap



Motivation

- **Understanding:**
 - how up-to-date are utilized software on the web,
 - security implications of utilizing outdated software.
- Large-scale analysis on 5.6M websites.

Overview on dataset

- **Dataset:**

- Historical data of websites
(01.2019 - 06.2020)



- Release history



- Vulnerability database



- **Dataset preparation & enrichment:**

- Convert all versions to SemVer format,
- drop all records with polluted data

Overview

- **Our dataset:**
 - 5.6M distinct sites,
 - 31.909 releases (Github + manual),
 - 342 distinct SW,
 - 147.312 CVEs.

M.	Date	#Sites	#Origins	#Products	#dist. Ver.	#Updates	#Vuln.
M#1	01/19	2.5M	3.4M	208	15,436	—	2,201
M#2	02/19	2.3M	3.1M	204	15,178	0.4M	2,224
M#3	03/19	2.3M	3.1M	205	15,390	0.5M	2,235
M#4	04/19	2.7M	3.5M	205	16,145	0.6M	2,291
M#5	05/19	2.8M	3.6M	216	16,741	0.4M	2,298
M#6	06/19	2.8M	3.6M	217	17,013	0.7M	2,310
M#7	07/19	3.0M	3.9M	215	17,438	0.6M	2,286
M#8	08/19	3.0M	3.9M	215	17,474	0.5M	2,316
M#9	09/19	3.0M	3.9M	215	17,682	1.0M	2,390
M#10	10/19	3.0M	3.8M	217	17,873	0.8M	2,424
M#11	11/19	3.0M	3.8M	217	17,958	1.0M	2,468
M#12	12/19	3.0M	3.8M	216	18,122	1.0M	2,478
M#13	01/20	2.9M	3.8M	217	18,173	0.8M	2,502
M#14	02/20	2.7M	3.4M	211	17,558	0.4M	2,526
M#15	03/20	3.1M	3.9M	217	18,558	0.4M	2,412
M#16	04/20	3.3M	4.2M	217	19,321	0.6M	2,467
M#17	05/20	3.1M	4.0M	220	19,353	0.8M	2,460
M#18	06/20	3.4M	4.4M	218	20,118	0.6M	2,475

Table 1. Overview of all measurement points.

Update behavior of websites

- a median of 3 evaluable software products per website (min: 1, max: 17, avg: 3.37)
- 94% of all observed websites were not fully updated,
- 74% of software out-of-date for each website.

Update behavior from software perspective

- AVG age of software **44 months** (41 newer releases)

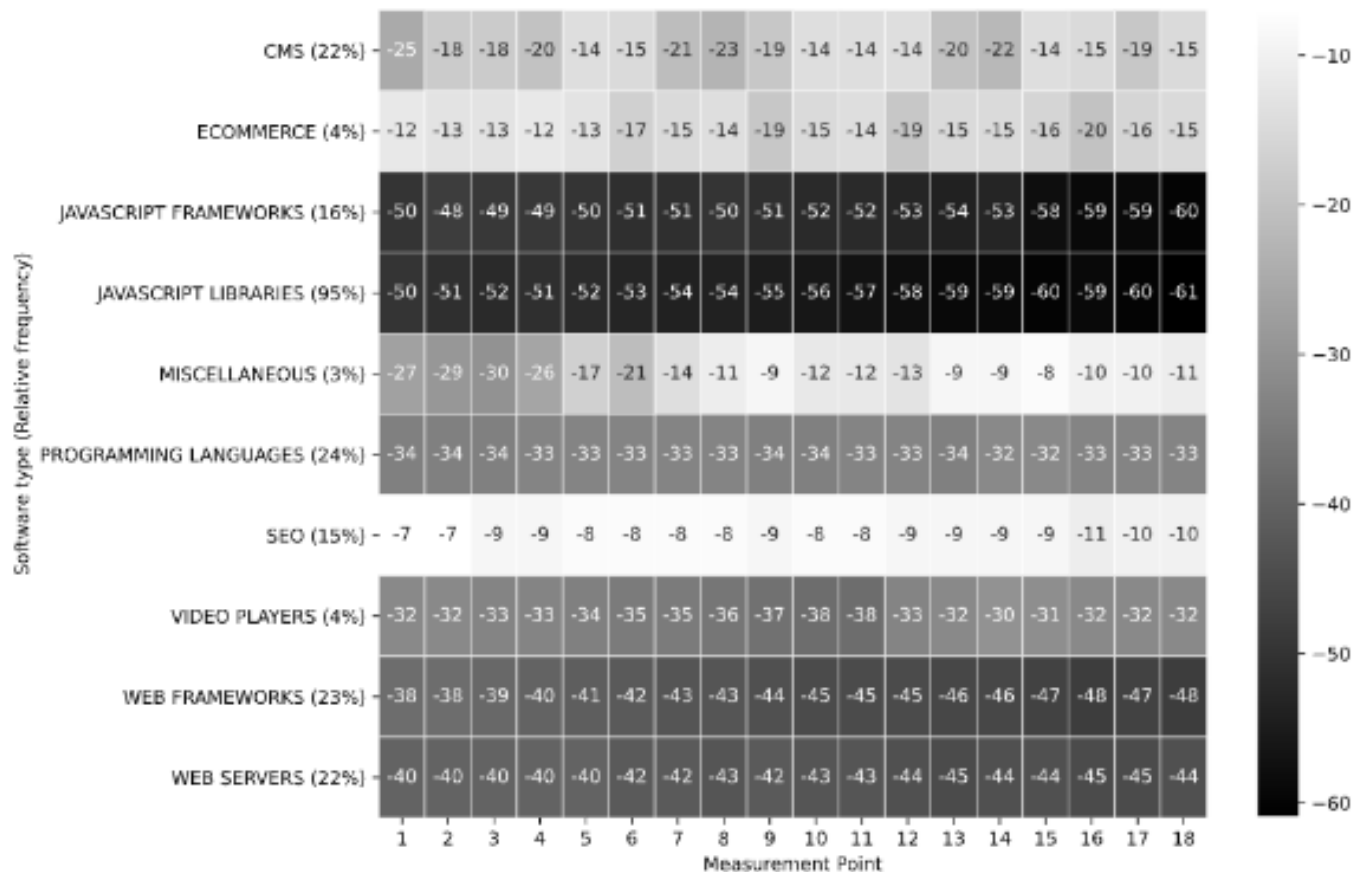


Fig. 2. Average age (in month) of top utilized 10 software types for all measurement points.

Adoption of SW releases

- each month for 67% of software a new release
- 3.5 months between two updates

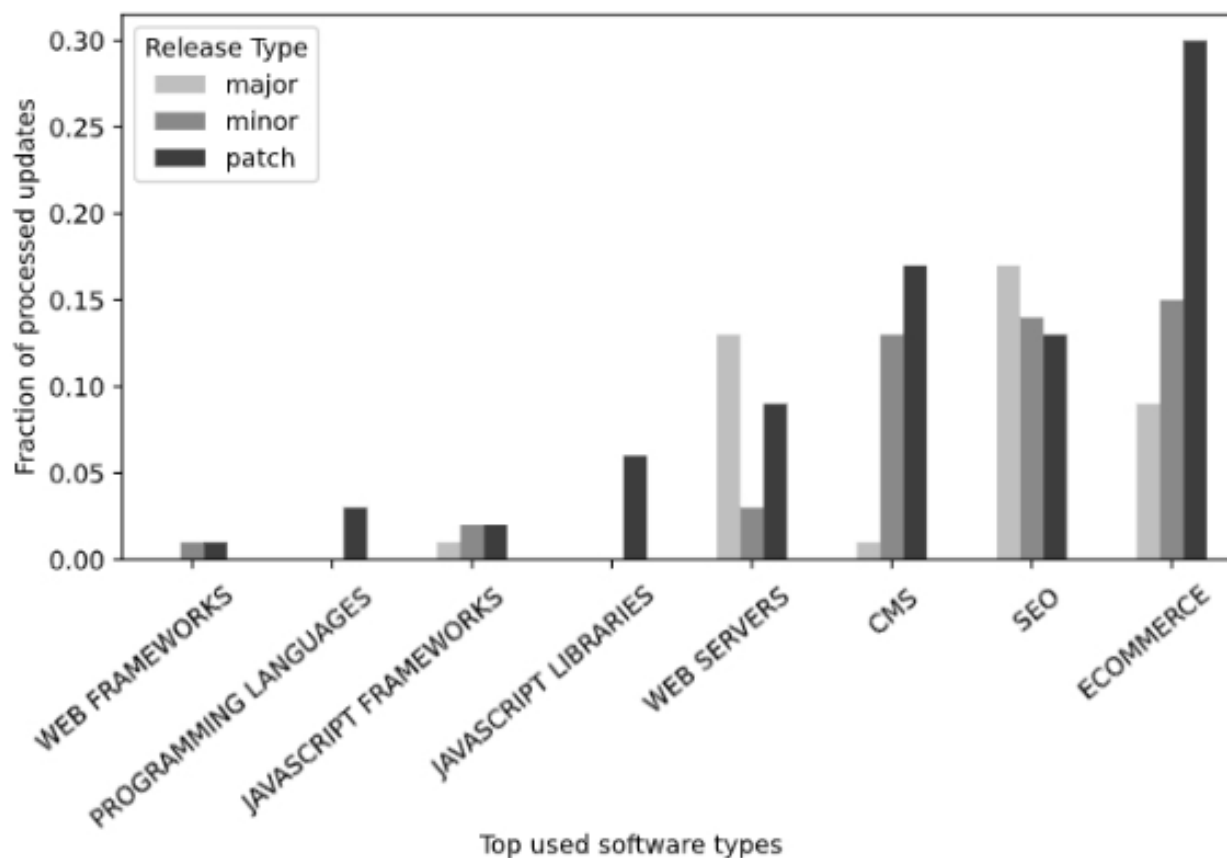


Fig. 3. Fraction of processing a new release for top used eight software types.

Security Impact of Not Updating

- **Vulnerability of websites:**
 - 94% of websites: at least one vulnerable SW
 - 12% of websites: at least one critical vulnerability (CVSS = 10)
 - Impact of performing updates: CVSS 6.2 -> 2.4

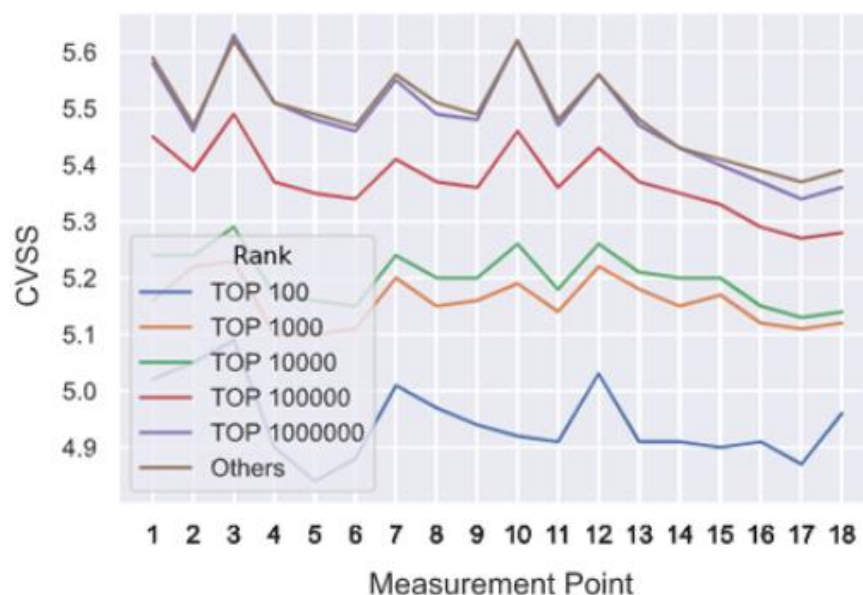


Fig. 4. AVG CVSS by popularity of websites. Vulnerability severity is significantly lower for high-ranked websites.

Limitations of our measurement

- HTTPArchive:
 - only landing pages,
 - no interaction with websites.
- Wappalyzer:
 - may not detect all used SW
- NVD:
 - discussions & critics
- CVE:
 - No validation

Discussion

- Our measurement;
 - highlights the current state of the Web,
 - shows the update behavior of websites over the course of 18 month,
 - shows, most of the utilized software is outdated (by more than four years),
 - records, 95% of websites potentially contain at least one vulnerable software;
 - must be seen as an upper bound!
 - website providers need to take more care about updates.



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**Thank you!
Questions?**

Full paper
(free access)



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