UNCOVERING SECRETS OF THE MAVEN REPOSITORY: *MAVEN PACKAGING*

Maven, a widely adopted software ecosystem for Java libraries, plays a critical role in the development and deployment of software applications. The research aims to address this knowledge gap by conducting a comprehensive analysis of Maven packaging and informing developers, library maintainers, and more about Maven library practices.

INTRODUCTION

- The understanding of the composition and characteristics of the Maven repository is very limited, leaving users and contributors unaware of the contents they interact with.
- The research will help to make informed decisions for the optimization of library usage and contribute to the advancement of software engineering practices, especially software distribution.

OBJECTIVE

- RQ1 - How common are different packaging types on Maven?
- RQ2 - Which checksums are commonly used for bytecode and how do they change over time?
- RQ3 - Which qualifiers are widely used on Maven?
- RQ4 - What kinds of files are packaged in the libraries' executables?

METHODOLOGY

- Data Selection - Simple Random Sampling - One version per package - 479,915 sample packages
- Core Infrastructure
- RQ1
  - POM File, Maven Index, Maven Repository
- RQ2
  - Maven Repository - Parsing names of artifacts
- RQ3
  - Maven Repository - Parsing names of artifacts
- RQ4
  - Maven Repository - Resolving the primary executable and saving extensions of files

WORKFLOW

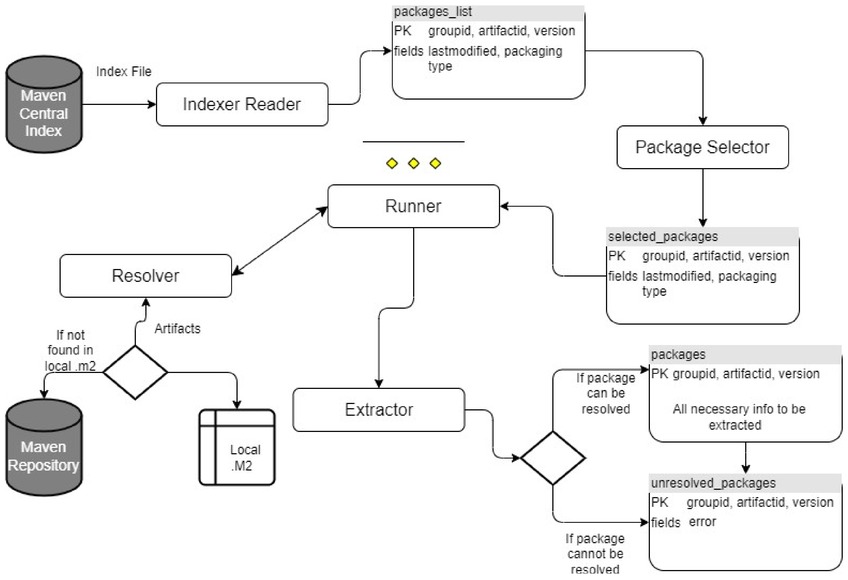

Figure 1: Overview of Core Infrastructure

ANALYSIS

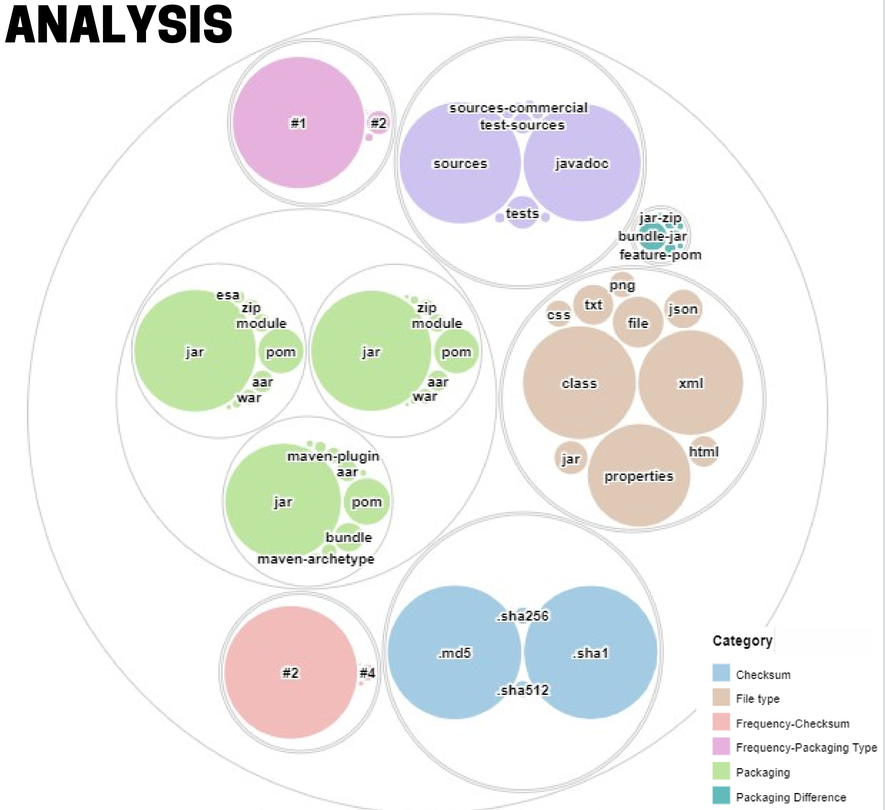

Figure 2: Summary of all the results

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RESULTS

- 1.4% of the packages were excluded from the analysis due to the unavailability of POM files.
- Inconsistency between sources
  - 9% of packages - POM file and the index file.
  - 4% of packages - Index file and the repository.
  - 12% of packages - POM file and the repository.
- 0.08% packages lacked any checksum algorithm.
- Sources and Javadoc comprise of 90% of total qualifiers present in repository.
- 80% of packages encompassed file types beyond the top 10 categories.

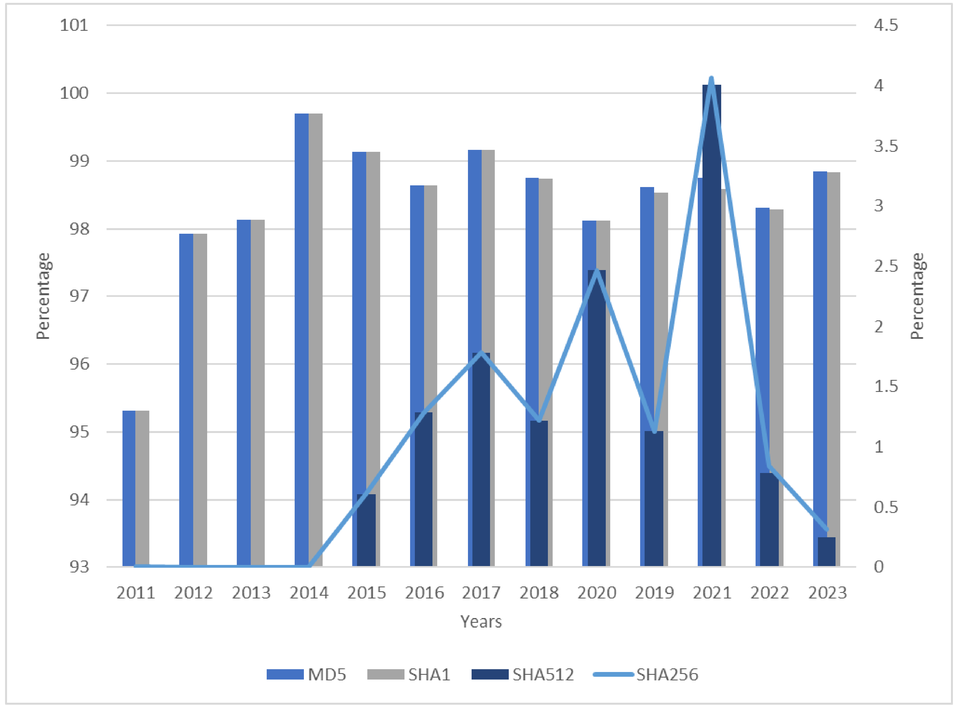
CONCLUSION

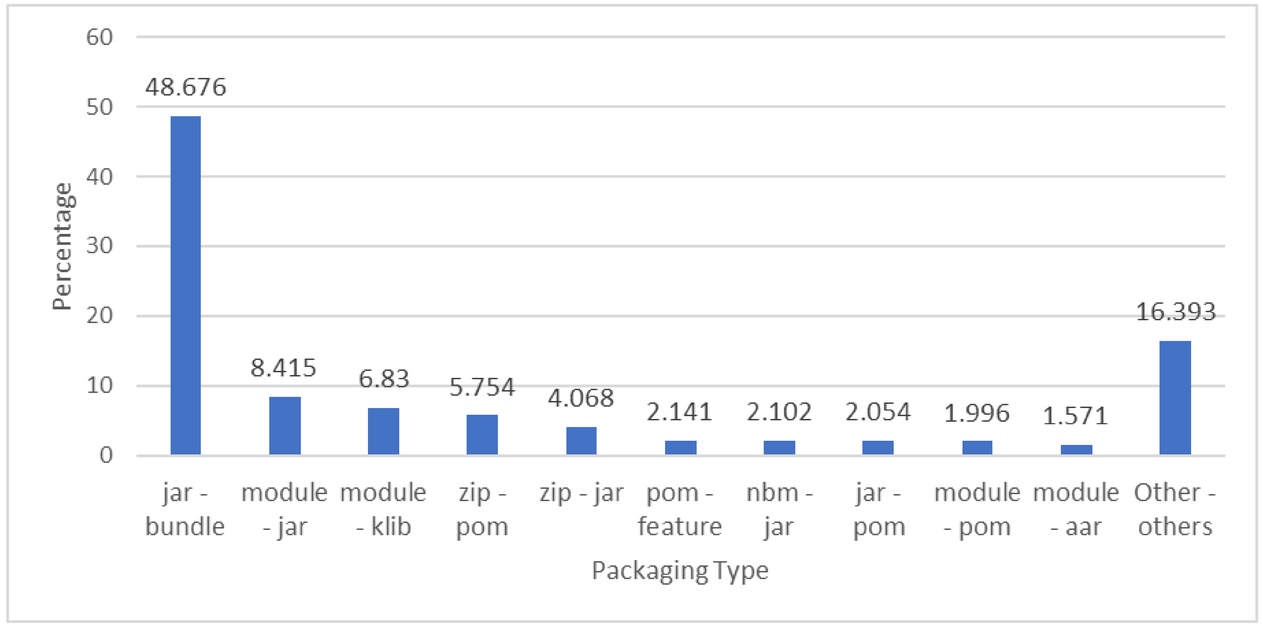
- Inconsistencies identified among different data sources, emphasize the need for improved data consistency and reliability within the Maven ecosystem.
- Encouraging wider adoption of secure hash functions, as only 1.4% packages utilize them.
- Develop adaptable approaches to optimize Maven library utilization and interplay between characteristics.

RELATED LITERATURE

- S. Raemaekers, A. Van Deursen, and J. Visser, "The maven repository dataset of metrics, changes, and dependencies," in 2013 10th Working Conference on Mining Software Repositories (MSR), pp. 221–224, IEEE,2013
- T. Kanda, D. M. German, T. Ishio, and K. Inoue, "Measuring copying of Java archives," Electronic Communications of the EASST, vol. 63, 2014
- A. Benelallam, N. Harrand, C. Soto-Valero, B. Baudry, and O. Barais, "The maven dependency graph: a temporal graph-based representation of maven central," in 2019 IEEE/ACM 16th International Conference on Mining Software Repositories (MSR), pp. 344–348, IEEE, 2019

CHARTS


101
100
99
98
97
96
95
94
93
Percentage
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Percentage
2011
2012
2013
2014
2015
2016
2017
2018
2020
2019
2021
2022
2023
Years
MD5
SHA1
SHA512
SHA256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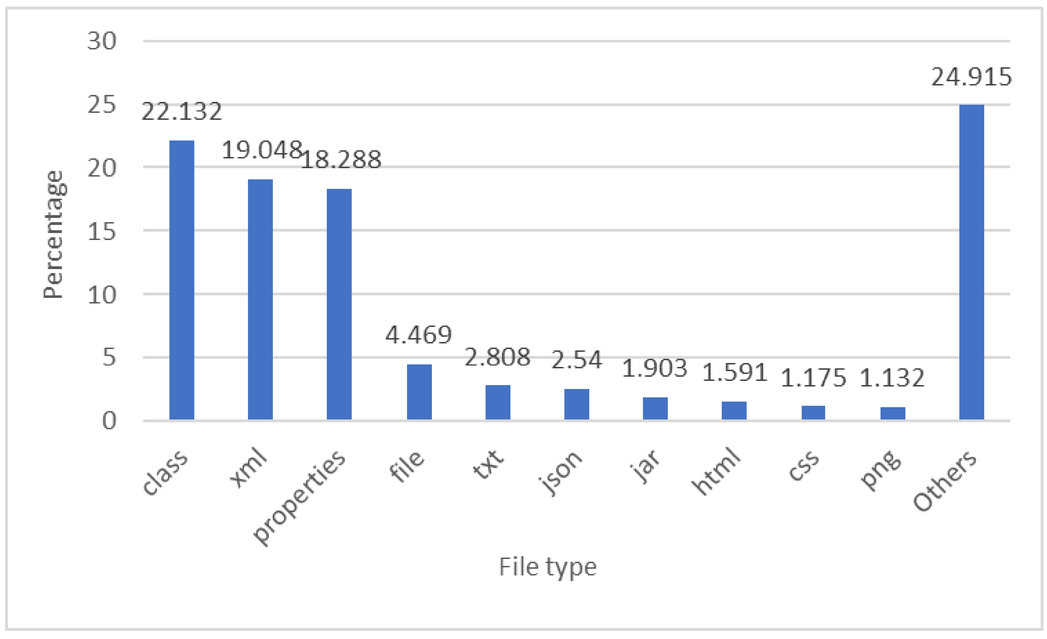
50
40
30
20
10
0
Percentage
48.676
8.415
6.83
5.754
4.068
2.141
2.102
2.054
1.996
1.571
16.393
jar - bundle
module - jar
module - klib
zip - pom
zip - jar
pom - feature
nbm - jar
jar - pom
module - pom
module - aar
Other - others
Packaging Type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25
20
15
10
5
0
Percentage
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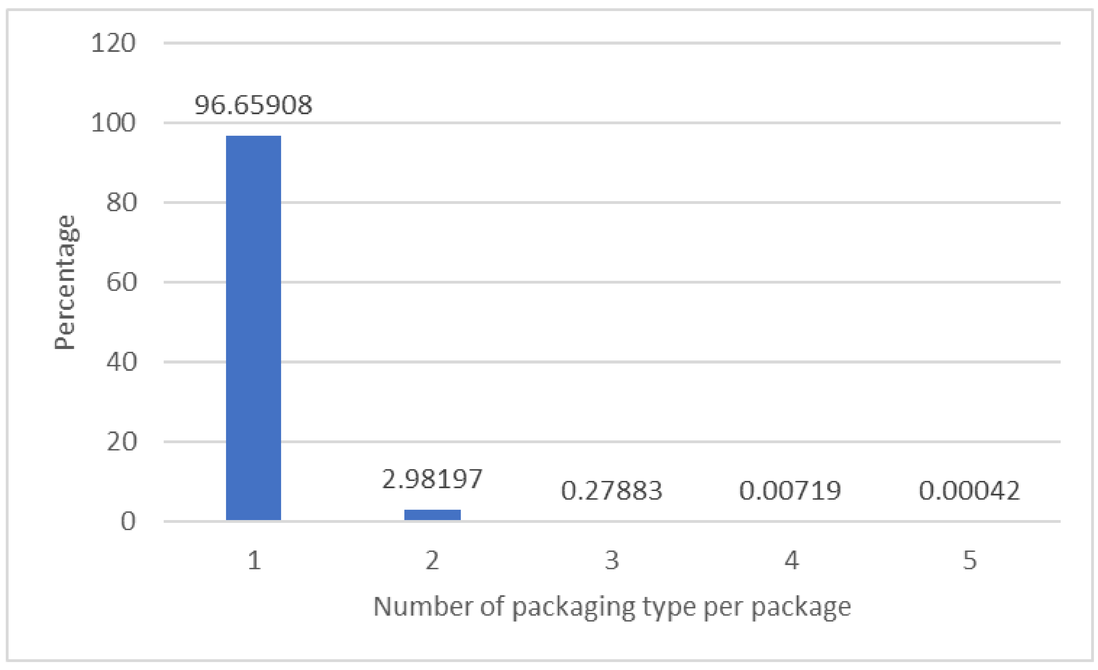
19.048
18.288
4.469
2.808
2.54
1.903
1.591
1.175
1.132
24.915
class
xml
properties
file
txt
json
jar
html
css
png
Others
File type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100
80
60
40
20
0
Percentage
96.65908
2.98197
0.27883
0.00719
0.00042
1
2
3
4
5
Number of packaging type per package