JSLibD: Reliable and Heuristic Detection of Third-party Libraries in Miniapps

Junjie Tao
taojunjie@stu.xjtu.edu.cn
Xi'an Jiaotong University

Jifei Shi
sjf528@stu.xjtu.edu.cn
Xi'an Jiaotong University

Ming Fan*
mingfan@mail.xjtu.edu.cn
Xi'an Jiaotong University

Yin Wang
wy0724@stu.xjtu.edu.cn
Xi'an Jiaotong University

Junfeng Liu
liujunfeng@stu.xjtu.edu.cn
Xi'an Jiaotong University

Ting Liu
tingliu@mail.xjtu.edu.cn
Xi'an Jiaotong University

ABSTRACT

Miniapps have become an indispensable part of people's lives. Meanwhile, the utilization of third-party libraries greatly streamlines, expedites, and enhances the development of miniapps. However, ensuring the security of these third-party libraries presents a challenge, as they may harbor security vulnerabilities, such as plaintext transmission.

In this paper, we propose **JSLibD**, an automated extraction method for third-party libraries in miniapps. Unlike conventional extraction methods that heavily rely on prior knowledge, **JSLibD** introduces a heuristic prediction approach, comprising two integral components: a whitelist matching method to match the known libraries and a heuristic prediction method to extract the unknown libraries using function call relationships. The results demonstrate that **JSLibD** can efficiently match known libraries, and accurately predict unknown libraries, achieving an impressive precision rate of 85.9% and a high recall rate of 97.2%.

CCS CONCEPTS

• **Security and privacy → Web application security**; **Software security engineering**; • **Software and its engineering**;

KEYWORDS

Mobile Security, Miniapp, Third-party Library

ACM Reference Format:
Junjie Tao, Jifei Shi, Ming Fan, Yin Wang, Junfeng Liu, and Ting Liu. 2023. JSLibD: Reliable and Heuristic Detection of Third-party Libraries in Miniapps. In *Proceedings of the 2023 ACM Workshop on Secure and Trustworthy Superapps (SaTS '23), November 26, 2023, Copenhagen, Denmark.* ACM, New York, NY, USA, 6 pages. https://doi.org/10.1145/3605762.3624428

**Corresponding authors

SaTS 2023, November 26, 2023, Copenhagen, Denmark

ACM ISBN 979-8-4007-0258-7/23/11…$15.00
https://doi.org/10.1145/3605762.3624428

1 INTRODUCTION

With the exponential growth of super apps' users, such as WeChat, Alipay, and other app-carrying manufacturers, miniapps have garnered a substantial user base, leading to the accumulation of users' privacy information. According to relevant data, by the end of 2022, miniapps have exceeded 7.8 million, and DAU exceeded 800 million[11]. However, this rapid expansion has also exposed security risks in data collection, deletion, and transmission processes, primarily concerning data security issues[23].

The key parties responsible for miniapp information collection and utilization include the first and third parties. The first party, referring to the miniapp developers, collects and utilizes information with user consent to fulfill its functional requirements. And the third-party encompasses the third-party SDKs used in miniapp, such as AutoNavi SDK and advertising libraries. These third-party SDKs can share user's sensitive information with the first party while providing their services. Presently, numerous third-party resource databases, including CDNJS, Baidu Cloud, Alibaba Cloud, etc., cover diverse types of third-party databases, such as advertising, statistical analysis, maps, and payment services. However, ensuring the security of these third-party libraries presents a challenge, as they may harbor security vulnerabilities, such as plaintext transmission.

Meanwhile, there is no work that investigates the third-party libraries of miniapps yet. Therefore, in this paper, we propose a **JSLibD** method for automated detection and matching of third-party libraries for miniapps. Specifically, our method consists of three steps.

This paper conducts a manual analysis of 635 miniapps with privacy policies across seven platforms, including Baidu, Tiktok, JD, Taobao, Toutiao, WeChat, and Alipay. Among these, 310 miniapps employ third-party libraries, accounting for 8.8% of the total. In total, 972 third-party libraries are utilized, with an average of 1.53 third-party libraries being used per miniapp, while the Suning.com miniapp use up to 14 third-party libraries. Additionally, the study collects 24 commonly used third-party libraries for miniapps as shown is Table 1, yet ensuring the security of these third-party libraries proves challenging. A significant majority of these libraries lack security auditing, and many code segments contain security vulnerabilities, such as plaintext transmission, posing substantial challenges to the security of miniapps. Furthermore, in the vast majority of miniapps, locating privacy policy protection agreements for third-party libraries is difficult or impossible. Moreover, some third-party platforms may collect user application information,