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# Privacy-Preserving Governmental Data Publishing: A Fog-Computing-based Differential Privacy Approach

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**Abstract**—With the growing availability of public open data, the protection of citizens' privacy has become a vital issue for governmental data publishing. However, there are a large number of operational risks in the current government cloud platforms. When the cloud platform is attacked, most existing privacy protection models for data publishing cannot resist the attacks if the attacker has prior background knowledge. Potential attackers may gain access to the published statistical data, and identify specific individual's background information, which may cause the disclosure of citizens' private information. To address this problem, we propose a fog-computing-based differential privacy approach for privacy-preserving data publishing in this paper. We discuss the risk of citizens' privacy disclosure related to governmental data publishing, and present a differential privacy framework for publishing governmental statistical data based on fog computing. Based on the framework, a data publishing algorithm using a MaxDiff histogram is developed, which can be used to realize the function of preserving user privacy based on fog computing. Applying the differential method, Laplace noises are added to the original dataset, which prevents citizens' privacy from disclosure even if attackers get strong background knowledge. According to the maximum frequency difference, the adjacent data bins are grouped, then the differential privacy histogram with minimum average error can be constructed. We evaluate the proposed approach by computational experiments based on the real data set of Philippine families' income and expenditures provided by Kaggle. It shows that the proposed data publishing approach can not only effectively protect citizens' privacy, but also reduce the query sensitivity and improve the utility of the data published.

**Keywords**—governmental statistical data publishing; privacy-preserving; fog computing; differential privacy; MaxDiff histogram

## I. INTRODUCTION

In the era of big data, information has become a type of strategic resource essential for the development of human society. As owners of the largest public data resources, governments have the

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