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Providing Privacy- Aware Incentives in Mobile Sensing System

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ABSTRACT: Mobile sensing relies on data contributed by users through their mobile device (e.g., smart phone) to obtain useful information about people and their surroundings. However, users may not want to contribute due to lack of incentives and concerns on possible privacy leakage. To effectively promote user participation, both incentive and privacy issues should be addressed. In this paper we introduce the two credit based privacy aware incentive schema for mobile instead of design of incentive mechanism. Our schemes enable mobile users to earn credits by contributing data without leaking which data they have contributed, and ensure that malicious users cannot abuse the system to earn unlimited credits. Specifically, the first scheme considers scenarios where an online trusted third party (TTP) is available, and relies on the TTP to protect user privacy and prevent abuse attacks. The second scheme considers scenarios where no online TTP is available. It applies blind signature, partially blind signature, and a novel extended Markel tree technique to protect user privacy and prevent abuse attacks. Security analysis and cost evaluations show that our schemes are secure and efficient.

KEYWORDS: privacy, incentive, mobile Sensing, Access control, privacy-preserving, key distribution, cloud computing

I. INTRODUCTION

The ever-increasing popularity of mobile devices such as smart phones and tablets and the rich set of embedded sensors that usually come with them (e.g., GPS, accelerometer and microphone) have created a huge opportunity of sensing. Mobile sensing tries to harness this opportunity by collecting sensing data through mobile devices and utilizing the data to obtain rich information about people and their surroundings. It has many applications in healthcare traffic monitoring, and environmental monitoring. However, the large-scale deployment of mobile sensing applications is hindered by two obstacles. First, there is a lack of incentives for mobile device users to participate in mobile sensing. To participate, a user has to trigger her sensors to measure data (e.g., to obtain GPS locations), which may consume much power of her smart phone. Also, the user needs to upload data to a server which may consume much of her 3G data quota (e.g., when the data is photos). Moreover, the user may have to move to a specific location to sense the required data. Considering these efforts and resources required from the user, an incentive scheme is strongly desired for mobile sensing applications to proliferate. Second, private information may be derived from a user's contributed data. Such privacy concern also prevents users from participating. For instance, to monitor the propagation of a new flu, a server will collect information on who have been infected by this flu. However, a patient may not want to provide such information since it is very sensitive. To effectively motivate users to participate, both obstacles should be overcome.

II. RELATED WORK

The ever-increasing popularity of mobile devices such as smart phones, tablets and a rich array of built-in sensors that usually come with it (eg, GPS, accelerometer and microphone) has created a great opportunity for sensing. Mobile

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sensor tries to take advantage of this opportunity by collecting sensor data from mobile devices and using data to get rich information about people and their surroundings. It has many applications in the field of health care [1], [2], traffic control [3], and environmental monitoring [4]. However, the widespread deployment of mobile sensor blocks applications by two obstacles. First, there is a lack of incentives for mobile users to participate in mobile sensing. To participate, the user must operate their sensors to measure the data (for example, to obtain GPS sites), which may consume a lot of power from its.

Smartphone. Also, the user needs to upload the data to a server that may consume a lot of its share of 3G data (for example, when data is images). In addition, the user may have to go to a specific location to sense the required data. Given these efforts and resources required from the user, the incentive plan is highly required for the multiplication of mobile sensor applications. Second, private information may be derived from data contributed by the user. This privacy concern also prevents users from participating. For example, to monitor the spread of a new flu, the server will collect information about who has been hit by the flu. However, the patient may not wish to provide such information because it is very sensitive. To motivate users to participate effectively, obstacles must be overcome.

Several other examples can be found in various mobile sensor systems [3], [4]. Unfortunately, this work can not be extended directly to support multiple reporting tasks, since building its own encryption allows only each user to earn credits from a single report. Although it is possible to create one task per report and then apply this schema, this will result in a significant increase in account and connectivity, and greatly complicates task management. For example, to gather the same amount of data as the multiple reporting task described above, you must create an individual report task every 10 minutes, and you must calculate, distribute, and process each set of encrypted credentials for each task.

To motivate users to participate effectively, obstacles must be overcome. [5], [6], [7], [8], [9], [10] were designed to encourage participation by paying balances to users. However, they address privacy and incentives separately. It is not an alternative to addressing incentives and privacy at the same time. One may simply consider combining a privacy protection system with a credit-based incentive system to provide both privacy and motivation, but this group is not easy because these schemes have been designed under various system models and assumptions. More importantly, simple combination can not address the new challenges that arise only when both motivation and privacy are seen, and are not addressed by the privacy protection system or incentive system. In particular, existing privacy systems provide anonymity for users. Hiding a greedy user may allow unlimited anonymous data reporting for the same sensor function (which is always undesirable) and gain unlimited balances without being detected. This will increase the cost of data collection. Moreover, under the protection of anonymity, a malicious user who has threatened mobile devices to other users can steal user security credentials such as cryptographic keys and use anonymous identity data to cheat and gain as many credits as possible without being detected. Thus, the main major challenge in designing credit-based incentive schemes for mobile sensor is how to prevent many assault attacks while maintaining. Our previous work [29] is to design a privacy incentive system for a special scenario for mobile sensing where each sensor task requires only one data report from each user (this task is referred to as an individual reporting task). An example of a single report task is "reporting the noise level around you now", which only requires each user to report individually on a measured noise level. But in the real world, there are many sensor tasks that require multiple reports to be presented at different times of each user (this task is referred to as the Multi-Report Task). An example of a multi-task report is "Noise report around you every 10 minutes in the following week"

III. EXISTING SYSTEM APPROACH

Our previous work design a privacy aware incentive scheme for a special scenario of mobile sensing where each sensing task requires only one data report from each user (such a task is called as the single report task) An Example of single report task is "Report the noise level around you now" which only requires the each user to submit a single data report of his measured noise level. In real world ,however there are many sensing task that require multiple reports submitted at different time from each user (Such task is called as the Multiple reports task) example of multiple report are "Report the noise level around you every 10 min in following week" unfortunately that work can be directly

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extended to support multiple system since its cryptographic construction only allows one task for each user to earn credits from one report.

Disadvantage

1. Schemes provide anonymity for user.
2. Increase the cost of data collection
3. A malicious user who has compromised other users mobile devices can steal those users' security credentials such as the cryptographic key and anonymously use the stolen credentials to cheat and earn as many credits.

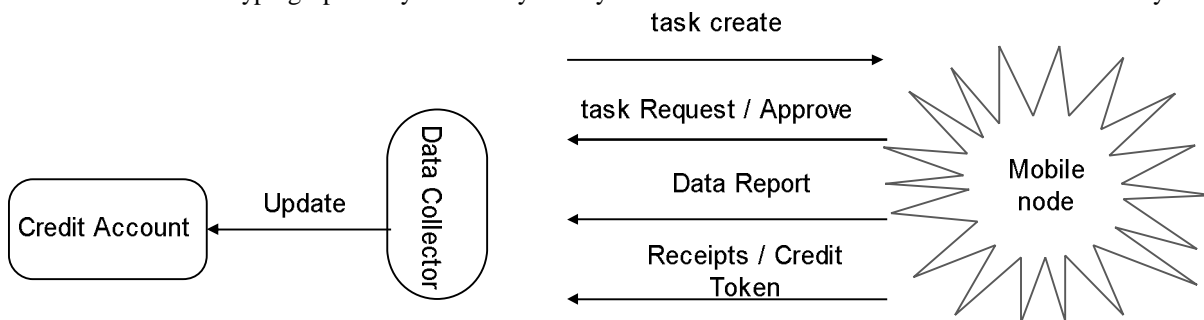


Figure 1 Existing System

IV. PROPOSED SYSTEM ARCHITECTURE

Our proposed paper two privacy –aware incentive scheme for mobile sensing that can support multiple report task. Our system use the credit based approach which allows each user to earn credits by the contributing its data without leaking which data is contributed. At same time fake or malicious user cannot abuse the system. First scenarios where TTP (trusted third party) is login and protected privacy and prevent abuse attacks and has very low computation cost. First mobile node send the Request to TTP then After verify the Request then TTP Accepts the Node Request and Send to Data Collector , DC allowed the task to request Node.

ADVANTAGES OF PROPOSED SYSTEM

1. Multiple report task are available.
2. Short running time
3. Efficient support dynamic joins

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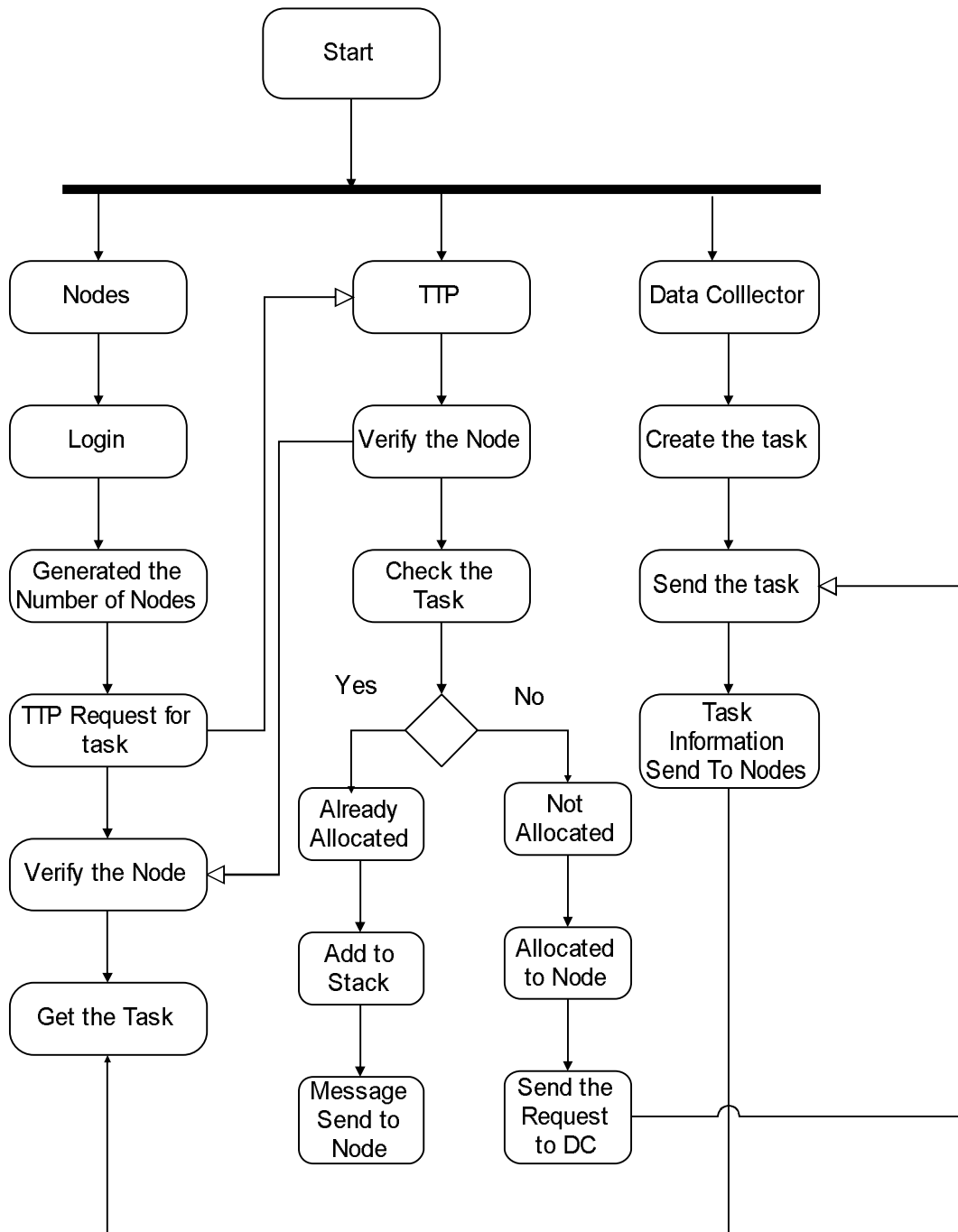


Fig 1. Proposed System Architecture

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V. CONCLUSION

To promote user participation, we proposed two credit based privacy-aware incentive schemes for mobile sensing, corresponding to scenarios with and without a TTP respectively. Mainly based on hash and HMAC functions, the TTP-based scheme has very low computation cost at each node. Based on blind signature, partially blind signature, and extended Merkle tree techniques, the TTP-free scheme has higher overhead than the TTP-based scheme but it ensures that no third party can break user privacy. Both schemes can efficiently support dynamic joins and leaves. Implementations show that both schemes have short running time and lower power consumption.

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