PRIVACY-PRESERVING OPTIMAL MEETING LOCATION DETERMINATION ON MOBILE DEVICES

Malathi S Y[1], Maithri C[2]

[1,2] Department of Computer Science and Engineering,

Kalpataru Institute of Engineering & Technology, Tiptur, (India)

ABSTRACT

Protecting privacy in location based services is an important requirement in wireless communication. Many privacy preserving approaches exist that allow protecting privacy in location based services. These applications often rely on current (or preferred) locations of individual users or a group of users to provide the desired service, which jeopardizes their privacy users do not necessarily want to reveal their current (or preferred) locations to the service provider or to other, possibly un-trusted users. The main aim of privacy-preserving algorithms is determining an optimal meeting location for a group of users.

Privacy evaluation is performed by formally quantifying privacy-loss of the proposed approaches.The performance of privacy preserving algorithms is determined by implementing and testing their execution efficiency on Nokia smart phones.

Keywords-Jeopardizes, Mobile application, Privacy

I. INTRODUCTION

The rapid growth of smart phone technology in urban communities has enabled mobile users to context aware services on their devices. Context aware service is a computing technology which incorporates information about current location of a mobile user to provide more relevant service to the user. Service providers make use of this context aware service to provide context-dependent services for mobile subscribers. Location sharing based services (LSBS), for example are used by millions of mobile subscribers every day to obtain location-specific information [1].

Privacy protection is of great importance for such service users in mobile and wireless networks. However, as mobile devices are highly autonomus and heterogeneous, it is challenging to design generic protection techniques and achieve high level of privacy protection. Investigate the problem of privacy loss in location sharing based services. Formulate the privacy issue in LSBSs by focusing on a specific problem called the Fair Rendez-Vous Point (FRVP) problem. Given a set of user location preferences, the FRVP problem is to determine a location preferences, the FRVP problem is to determine a location among the proposed ones such that maximum distance between this location and all other user's location is minimized, i.e. it is fair to all users. The main goal is to provide practical privacy-preserving techniques to solve the FRVP problem, such that neither a third-party, nor participating users, can learn other users locations. Participating users only learn the optimal location.

Privacy of a user's location or location preferences, with respect to other user's and the third-party service provider, is a critical concern in location-sharing-based applications. For instance, such information can be used to de-anonymize users and their availabilities, to track their preferences or to identify their social networks.

Without effective protection, evens parse location information has been shown to provide reliable information about a user's private sphere, which could have severe consequences on the user's social, financial and private life. Even service providers who legitimately track user's location information in order to improve the offered service can inadvertently harm user's privacy, if the collected data is leaked in an unauthorized fashion or improperly shared with corporate partners.

II. RELATED WORK

Bingham and Martin (2001) [2] considered the all-inclusive travel costs for multiple participant meetings. Bingham and Martin method is based on costs measured in currency, and it optimizes for minimizing total travel cost for all participants, considering such components as airfare, hotel, local transportation, meals, etc. It is appropriate for planning larger meetings (such as conferences, conventions, and trade shows) since any "errors" for each participant are offset by reciprocal errors for other participants, and for a large number of participants, the overall cost is negligible. However, their method is not practical when groups are small, or when other travel costs (e.g., participant time) are a more important consideration.

Chithambaram and Miller (2005) [3] introduced a system to find the meeting location that is the closest to the geographic center of several participants. Their method averages the latitudes and longitudes of each participant. It proposes the "best" meeting place by selecting the nearest location to the center from a list of points of interest.

Kaufman and Ruvolo (2006) [4] introduced a method to optimize location selection, considering the current locations of the participants (obtained from GPS coordinates or the location of other events in the participants' calendars). Their method calculates the proposed location based on proximity to the participants and availability of the resources needed at the location. Their method serially applies "filters" such as airfares, but does not solve in aggregate such potentially conflicting multi-criterial costs as money, time, or social constraints. These preferential weights have potential to "zero out" optimal location meeting sets.

Santos and Vaughn (2007) [5] presented a survey of existing literature on meeting-location algorithms and propose a more comprehensive solution for such a problem. **Friends Together:** If five friends want to get together at a restaurant. Two will be leaving from their workplaces, another is arriving at the local airport, one is finishing class at the university, and another will be leaving from home. Some will be driving, some will be taking public transportation, and some will have a choice. And all can walk. They want to get together immediately to eat. There are over 1,000 restaurants in this metro area, and many are acceptable to all. Where shall they go?

III. PROBLEM DESCRIPTION

Privacy of a user's location or location preferences, with respect to other user's and the third-party service provider, is a critical concern in location-sharing-based applications. For instance, such information can be used to de-anonymize users and their availabilities, to track their preferences or to identify their social networks.

Without effective protection, evens parse location information has been shown to provide reliable information about a user's private sphere, which could have severe consequences on the user's social, financial and private life. Even service providers who legitimately track user's location information in order to improve the offered service can inadvertently harm user's privacy, if the collected data is leaked in an unauthorized fashion or improperly shared with corporate partners.

The main goal is to provide practical privacy preserving techniques to solve the FRVP problem, such that neither a third-party, nor participating users, can learn other users' locations; participating users only learn the optimal location. The privacy issue in the FRVP problem is representative of the relevant privacy threats in LSBSs.

IV. PROPOSED SYSTEM

The privacy issue in LSBSs is solved by focusing on a specific problem called the ***Fair RendezVous Point*** *(FRVP)* problem. Given a set of user location preferences, the FRVP problem is to determine a location among the proposed ones such that the maximum distance between this location and all other users' locations is minimized, i.e. it is *fair* to all users. The goal is to provide practical privacy-preserving techniques to solve the FRVP problem, such that neither a third-party, nor participating users, can learn other users locations, participating users only learn the optimal location. The privacy issue in the FRVP problem is representative of the relevant privacy threats in LSBSs.

The FRVP problem is formulated as an optimization problem, specifically the k-center problem and then analytically outlines the privacy requirements of the participants with respect to each other and with respect to the solver (in this case, a third-party service provider). Then two algorithms are used for solving the above formulation of the FRVP problem in a privacy-preserving fashion, where each user participates by providing only a single location preference to the FRVP solver or the service provider. Two algorithms take advantage of the homomorphic properties of well-known cryptosystems, such as BGN, ElGamal and Paillier, in order to privately compute an optimally fair rendez-vous point from a set of user location preferences. Practically efficiency and performance of two algorithms is tested by means of a prototype implementation on a test bed of Nokia mobile devices.

V. CONCLUSION

Mobile has become a vital communication tool which everyone prefers to possess and carry along. The privacy issue in the Fair Rendez-Vous Problem (FRVP) is addressed effectively. The solutions are based on the homomorphic properties of well-known cryptosystems. The implementation and evaluation and the performance of algorithms are based on real time process.

The proposed solutions preserve user preference privacy and have acceptable performance in a real implementation. Moreover, the proposed algorithms are extended to include cases where users have several prioritized locations preferences. Finally, based on an extensive user-study, the proposed privacy features are crucial for the adoption of any location sharing or location-based applications.

REFERENCES

[1] (2011). *Microsoft Survey on LBS* [Online]

[2] Bingham, G., Martin, C., Meeting Site Selection Based on All-Inclusive Meeting Cost, United States Patent 6,324,517 (2001) tings," in *Proc. MapISNet*, 2007

[3] Chithambaram, N., Miller, C.A.: Meeting Location Determination using Spatio-Semantic Modeling. United States Patent 6,865,538 (2005)

[4] Kaufman, J.H., Ruvolo, J., Dynamic Resource Scheduling to Optimize Location of Meeting Participants. United States Patent 7,027,995 (2006)

[5] P. Santos and H. Vaughn, "Where shall we meet? Proposing optimal locations for meet.

ACKNOWLEDGEMENT

The authors would like to thank Kalpataru Instituite of Engineering & Technology, Bangalore for their co-operation and support.