Preserving Location Privacy

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Abstract : ***This paper provides complete details of the proposed methodology along with the design, prototype implementation, and evaluation of LocX, a system for constructing an location-based social application by preventing the discovery of the user location. The task is carried-out by maintaining the overall system efficiency. The architecture mainly uses two servers one is the proxy server and the other is the index server. Proxy server is used to store co-ordinate values in encrypted format. And index server is used to store content values of user. In this proposed system both user have to register first. And only register user can access their notification. User one shares particular longitude value and latitude value to another user.***

IndexTerms - LBSA's, proxy server, index server.

I. INTRODUCTION

The operation of Go-social applications is mainly based upon fine-grain, time-stamped location information hence it is also termed as Location-Based Social Applications (LBSAs). Geo-social networking is referred as a social networking in which geographic services and capabilities like geo coding and geo tagging are mainly used to enable additional social dynamics. Whenever an user submits the location data it allows the social networks to connect and coordinate users with local people or events that match their interests. LBSAs are referred to as permission-based applications that are capable to use real-time location intelligence from a customer's mobile device.
Social networking provides larger benefits compared to other sources. Based upon these criteria a wireless virtual social network which mimics the way people seek information in their social circles. This network with the strategic advantage provides the fact that mobile devices are becoming increasingly sophisticated and commonly support multiple network interfaces. Mobile devices such as laptops, smartphones, and PDAs are increasingly being fitted out with multiple wireless network interfaces. The multiple wireless network interfaces includes mainly one or more wireless LAN interfaces (e.g., 802.11, Bluetooth) and wireless WAN interfaces (e.g., GPRS, UMTS). The devices allow having a choice of radios to use separately. Improvements within the sensors and wireless communication technology enable accurate, automated determination and dissemination of a user's or object's position. The exploitation of the positional data taken an immense interest through location-based services which in short is also referred to as LBS.

II. RELATED WORK

Ganesh ananthnarayanan, Venkata N Padmanabhan, Lenin Ravindranath, Chandramohan A [1] have proposed a COMBINE system. This system is mainly for the collaborative downloading where in devices that are within WLAN range pool together their WWAN links, significantly increasing the effective speed available to them. COMBINE makes a number of novel contributions over prior work in this area, including: (a) a framework of incentives for collaboration that addresses several practical issues including the unification of monetary and energy costs, and on-the-fly estimation of the energy cost of communication in a system in operation; (b) a protocol for collaborative group formation and workload distribution that is energy efficient and adaptive to fluctuations in network conditions; and (c) an application-level striping procedure that eases deployment by avoiding the need for special-purpose proxies in the infrastructure. The experimental results are shown based upon the prototype which is implemented that show encouraging speeds-ups with COMBINE. Further it is declared that the collaborative downloading offers the potential for the performance gain with the utilization of WLAN and WWAN links in the combination mode. The concept further describes the design, implementation, and initial performance from a prototype known as the COMBINE and provides a framework to provide the practical economic incentives to the collaborators. The COMBINE keeps a certain set of demands both on wired and wireless infrastructure.

Marco Gruteser and Dirk Grunwald [2] describes a system, in which a middleware Architecture and algorithms that can be used significantly by a centralized location broker service is presented. Further the adaptive algorithms is capable to adjust the resolution of the location information including both the spatial or temporal dimensions to meet the required anonymity constraints that are based on the entities who may be using location services within a given area. The proposed model that is mainly developed on an automotive traffic counts and cartographic material is used to estimate the realistically expected spatial resolution for various anonymity constraints. Thus the median resolution generated by the algorithms is 125 meters stating that the anonymous location-based requests for urban areas would have the same accuracy currently needed for E-911 services; further it is declared that this would provide sufficient resolution for wayfinding, automated bus routing services and similar kind of location-dependent services. It is known that the proposed method analyzed the technical feasibility of an anonymous
use of location-based services. Further it showed that the location data introduces a new and a potentially more severe privacy risks than network addresses pose within the conventional services. The combination of the re-identification and the location tracking risk can be reduced with the usage of k-anonymous data. A system model along with the quad tree-based algorithm is introduced to guarantee k-anonymous location information through the reductions within the location resolution. The main question that is addressed was whether the resulting data accuracy is sufficient for the location-based services. Where the accuracy is dependent on traffic conditions, the algorithm was empirically evaluated with the usage of a traffic distribution model that is derived from the traffic counts and cartographic material. The conclusion that are drawn are based upon the proposed method are: The accuracy level of the quad-tree based algorithm is

reached compared to that with the phase-II E-911requirements. In areas having the major highways the median accuracy will be approximately 30m that increases to 250m for city areas with large block sizes. These results were obtained with an anonymity constraint of 5, leading to a mean anonymity level of approximately 10 people who may have issued an exact request. Spatial resolution can be significantly improved through a several second's reduction in temporal resolution. Because of the imposed delay, this method is most applicable to non-interactive services.

Mohamed F. Mokbel Chi-Yin Chow Walid G. Aref [3] have proposed a framework in to which users are capable to entertain anonymous location- based services the framework Casper mainly consists of two main components one is the location anonymizer that blurs the users exact location into cloaked spatial regions and the second is the privacy-aware query processer which is responsible on providing location based services that is further based on the cloaked spatial regions.

Bill Schilit Jason Hong Marco Gruteser [4] have proposed a method that recognizes the need for location privacy standards including internet engineering task force. The IETF working group which is examining some of the risks associated with the location based services and proposed several requirements for location privacy.

Prashanth Mohan Venkata N.Padmanabhan Ramachandran Ramjee [5] have proposed a system known as Nericell, the system performs rich sensing by piggybacking on smartphones that the users carry with them in normal course. It is mainly focused on sensing components that uses the accelerometer, microphone GSM radio or GPS sensors within these phones to detect potholes, bumps, braking, and honking. Nericell addresses several challenges that include virtually reorienting the accelerometer on a phone which is at an arbitrary orientation, and performing honk detection and localization in an energy efficient manner. The idea to touch upon of a triggered sensing, where dissimilar sensors are being used within the tandem to conserve energy. The evaluation of the effectiveness of the sensing functions within the Nericell based on experiments conducted on the roads of Bangalore leads to an promising results.

III. METHODOLOGY

Software Development Life Cycle (SDLC) it is a process that is used by the software industry to design, develop and test high quality software's. The SDLC mainly aims to produce a high-quality software that is capable to meet or exceed the customers' requirements, reaches completion within times and cost estimates.

SOFTWARE ENGINEERING MODEL

Waterfall Model:

This is the traditional and legacy model for software development projects. This methodology has been in practice for decades before the new methodologies were established. The model consists of development lifecycle has fixed phases and linear timelines. This model is not capable enough to deal with the current challenges in the modern software development domain.

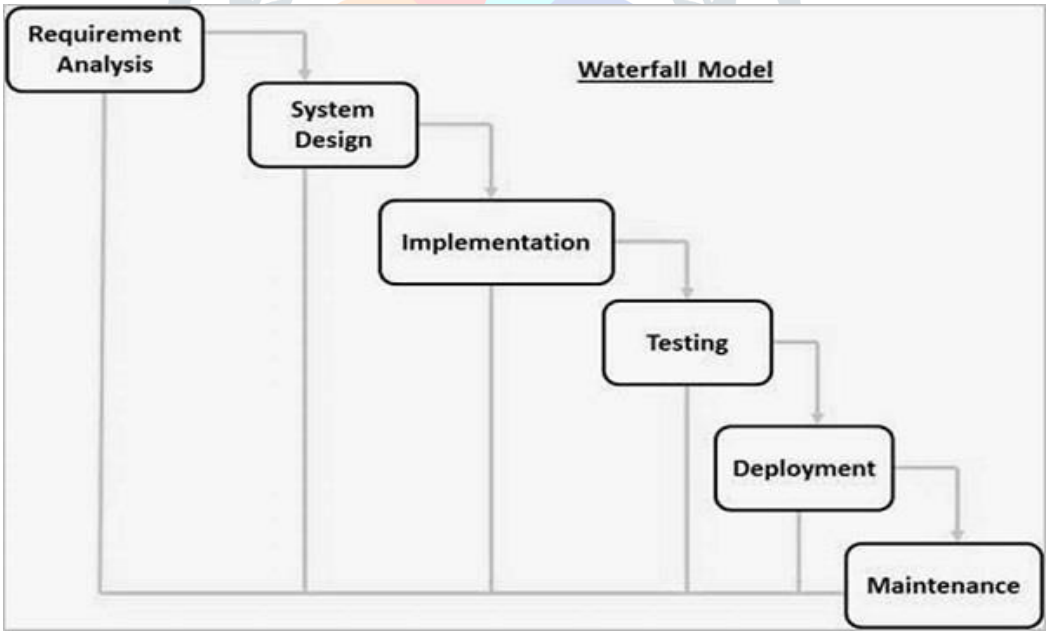

Figure 1 Waterfall Model

Figure 1 Waterfall approach was first SDLC Model to be utilised widely within the Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate phases. In this Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially.

The sequential phases in Waterfall model are −

- Requirement Gathering and analysis − All possible requirements of the system to be developed are captured in this phase and documented in a requirement specification document.
- System Design −The requirement specifications from first phase are studied in this phase and the system design is prepared. This system design helps in specifying hardware and system requirements and helps in defining the overall system architecture. The modules that are used in case of system designing are: LocX module, Proxy server, Index server.
- Implementation −With inputs from the system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality, which is referred to as Unit Testing. Its major elements include test plan, training plans, an equipment installation plan and a conversion plan.

- Testing- The test plan provides for the preparations of the test ad for testing the system in a planned, structured manner. Training plan is necessary to ensure that all people who are associated with the computer related information system have the necessary knowledge and skills .The important activities are preparations ,equipment installation and hardware –software checkout.

Conversion is the process if initiating and performing all the physical operations that result directly in the turnover of the new system to the user. There are two parts of conversion .The conversion plan is implemented throughout the development phase into the operational phase. The conversion plan includes procedural conversion, program conversion and the file conversion. The changeover plan also specifies the method of change from old to new system.

- Integration and Testing − All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures. There are various testing methods that are used such as: Unit testing, Integration testing, Functional testing, white box testing, and black box testing.
- Deployment of system − Once the functional and non-functional testing is done; the product is deployed in the customer environment or released into the market.
- Maintenance − There are some issues which come up in the client environment. To fix those issues, patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

All these phases are cascaded to each other in which progress is seen as flowing steadily downwards (like a waterfall) through the phases. The next phase is started only after the defined set of goals are achieved for previous phase and it is signed off, so the name "Waterfall Model". In this model, phases do not overlap.

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IV. RESULTS AND DISCUSSION

Figure 2 User Login

Figure 3 Index Server

Figure 4 Proxy Server

Figure 5 Sharing Details

V. CONCLUSION

This paper describes the design, prototype implementation, and evaluation of LocX, a system for building location based social applications (LBSAs) while preserving user location privacy. LocX provides location privacy for users without injecting uncertainty or errors into the system, and does not rely on any trusted servers or components. LocX takes a novel approach to provide location privacy while maintaining overall system efficiency, by leveraging the social data-sharing property of the target applications. In LocX, users efficiently transform all their locations shared with the server and encrypt all location data stored on the server using inexpensive symmetric keys. Only friends with the right keys can query and decrypt a user's data. We introduce several mechanisms to achieve both privacy and efficiency in this process, and analyze their privacy properties.

Using evaluation based on both synthetic and real-world LBSA traces, we find that LocX adds little computational and communication overhead to existing systems. Our LocX prototype runs efficiently even on resource constrained mobile phones. Overall, we believe that LocX takes a big step toward making location privacy practical for a large class of emerging geo-social applications.

REFERENCES

[1] P. Mohan, V.N. Padmanabhan, and R. Ramjee. 2008. "Nericell: Rich Monitoring of Road and Traffic Conditions Using Mobile Smartphones," Proc. Sixth ACM Conf. Embedded Network Sensor Systems.

[2] G. Ananthanarayanan, V.N. Padmanabhan, L. Ravindranath, and C.A. Thekkath. 2007. "Combine: Leveraging the Power of Wireless Peers through Collaborative Downloading," Proc. Fifth Int'l Conf. Mobile Systems, Applications Services,

[3] B. Schilit, J. Hong, and M. Gruteser. 2003. "Wireless Location Privacy Protection," Computer, vol. 36, no. 12, 135-137.

[4] M. Gruteser and D. Grunwald. 2003. "Anonymous Usage of Location-Based Services through Spatial and Temporal Cloaking", Proc. First Int'l Conf. Mobile Systems, Applications Services.

[5] M.F. Mokbel, C.-Y. Chow, and W.G. Aref. 2007. "The New Casper: A Privacy-Aware Location-Based Database Server", Proc.IEEE 23rd Int'l Conf. Data Eng.