Research Statement

Jilian ZHANG
School of Information Systems,
Singapore Management University
Email: jilian.z.2007@phdis.smu.edu.sg

Background

Database outsourcing is a promising, new paradigm for data management, in which a third party service provider hosts databases, potentially of huge volume, for its customers. This *database as a service* model has several advantages that attract attentions from both academic and industrial communities. On the one hand, it alleviates the need for organizations to purchase expensive hardware and software, hire excessive DBA staffs, and perform tedious database maintenance routines. On the other hand, it also enables data owners to efficiently create, store, and access their databases at the host site. However, there are several major concerns about the data security and integrity from the data owner's and the query user's perspective, respectively.

Current Research

The first challenge in database outsourcing model is to protect the confidentiality of the outsourced data that the owner may not want to reveal to the service provider. On the other hand, as a concern of potential privacy leakage, some query users are reluctant to expose to the service provide about what they have been visitied on the hosted databases. To deal with these security issues, much research work has been conducted. Existing techniques and models for preserving data confidentiality and access privacy include database encryption, oblivious random access machine (ORAM), privacy information retrieval (PIR), privacy-preserving database indexing, etc. My current research interest focuses on how to protect privacy of user's access patterns on outsourced databases. We discover that traditional techniques, such as data encryption and encrypted B^+-tree, provide very weak protection of user access patterns. As an outcome, we propose a privacy-preserving indexing structure to hide user access patterns, which is efficient and practical compared with the expensive PIR-like schemes.

To protect the integrity of outsourced databases is of the utmost importance for users that submit queries to the service provider. Since the service provider may not be trusted, or the underlying network communication channel may

have been eavesdropped by hackers or malicious users. Therefore, query results returned from the service provider must be authenticated for integrity, completeness, and freshness. Currently, researchers have proposed various schemes and techniques for query authentication on relational databases, text search engines, and roadnetworks. For example, to authenticate selection, projection, joins, top-k keyword query, shortest path query, etc. My current research effort is on designing authentication scheme for other kinds of queries, such as skylines, on traditional or uncertain databases.

References

[1] PANG HweeHwa, ZHANG Jilian, MOURATIDIS Kyriakos. *Scalable Verification for Outsourced Dynamic Databases*, In Proceedings of the 35^{th} International Conference on Very Large Data Bases (VLDB), 2009

[2] *Privacy-Preserving Range Retrievels over B^+-trees*, Under review.