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Cost-Efficiency And Privacy Preserving With Eirq Methods In Commercial Cloud

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Abstract: ***Cloud computing emerges as a hottest trend in area of information technology and heterogeneous networking. Due to less efficient allocation resources in a cost-efficient cloud environment, a user can tolerate a certain degree of delay while retrieving information from the cloud to reduce costs. In this paper, we focused on two primary issues in such an environment: search privacy and efficiency. We first come across a private searching scheme that was originally proposed by Ostrovsky. Their private keyword based retrieval scheme allows a user to retrieve files of interest from un-trusted servers in leakage of any information. The main drawback is because of processing of all the queries from different users, it will cause a heavy querying overhead incurred on the cloud and thus goes against the original intention of cost efficiency. In this paper, we present three efficient information retrieval for ranked query (EIRQ) schemes to reduce querying overhead incurred on the cloud. In EIRQ, queries are classified into multiple ranks, where a higher ranked query can recover a higher percentage of matched files on user demand. A user can retrieve files on demand by choosing queries of different ranks. This feature is useful when the user only needs a small subset of files from large number of matched files. This system introduces retrieval of files with low bandwidth and low computational and communication cost. Under different parameter settings, extensive evaluations have been conducted on both analytical models and on a real cloud environment, in order to examine the effectiveness of our schemes.***

Keywords: ADL, Differential query services, EIRQ, ranking, Ostrovsky

1. Introduction

Cloud computing enables convenient, ubiquitous, on-demand network access to a shared pool of configurable computing resources that can be rapidly maintained and released with minimal management effort [3]. As clouds are cost effective, flexible and scalable, many organizations are looking forward to outsource their data for sharing. In clouds, files are identified by keywords [7] with a query and retrieves the files that are interested. The objective for the cost efficient clouds is to cost of CPU consumption, cost of network bandwidth usage, increase privacy of users. In this scenario, the protection of user will be major issue. User privacy [2] can be categorized into search privacy and access privacy. Search privacy deals with the user's search and access privacy deals with the fields that are to be returned. Ostrovosky scheme [4] is old-fashioned as it has to process all the keywords in each and every file. This process leads to heavy query overhead from different users. A novel solution would be to make a rank matrix that enhances the user privacy than the previous methods. EIRQ scheme address the issues of privacy, aggregation, computational cost and bandwidth wastage.

2. Related Work

Private searching was proposed by Ostrovsky allows user to retrieve files of interest from an untrusted server without leaking any information. Otherwise, the cloud will learn that certain files, without processing, are of no interest to the user. Commercial clouds follow a pay-as-you-go model [8], where the customer is billed for different operations such as bandwidth, CPU time, and so on. To make private searching applicable in a cloud environment, our previous work designed a cooperate private searching protocol (COPS) [6], where a proxy server, called the aggregation and distribution layer (ADL), is introduced between the users and the cloud. Our aim is to protect user privacy through differential query services by Aggregation and distributions Layer. The ADL deployed inside an organization has two main functionalities: aggregating user queries and distributing search results. Under the ADL, the computation cost incurred on the cloud can be largely reduced, since the cloud only needs to execute a combined query once, no matter how many users are executing queries. Furthermore, the communication cost incurred on the cloud will also be reduced, since files shared by the users need to be returned only once. Most importantly, by

using a series of secure functions, COPS can protect user privacy from the ADL, the cloud, and other users. The problems with existing scheme has a high computational cost [2], since it requires the cloud to process the query on every file in a collection. It will quickly become a performance bottleneck when the cloud needs to process thousands of queries over a collection of hundreds of thousands of files [1]. That is the reason we shift our momentum of research towards differential query services with ADL in order to reduce computational cost, low bandwidth usage.

3. System Architecture

3.1 Model

In Co-operate searching protocol, ADL acts as a proxy server [5] and as a mediator between user and cloud. The three entities in the system model are multiple users, ADL and cloud. When a user sends queries to cloud it is first reached to ADL, where all the queries from the users are aggregated and sent to processed by the cloud and sends the file buffer to ADL. ADL now takes the responsibility of distributing the files to its corresponding users. Thus the bandwidth usage is minimized.

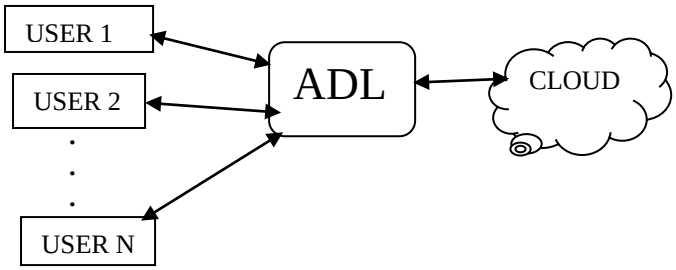

Figure 1: System Model

4. Proposed System

In this paper, we introduce a major concept, differential query services, to COPS, where the users are allowed to personally decide how many matched files will be returned. This is motivated by the fact that under certain cases, there are a lot of files matching a user's query, but the user is interested in only a certain percentage of matched files In the Ostrovsky scheme, the cloud will have to return 2,000 files. In the COPS scheme, the cloud will have to return 1,000 files. In our scheme, the cloud only needs to return 200 files. Therefore, by allowing the users to retrieve matched files on demand, the bandwidth consumed in the cloud can be largely reduced. Efficient Information retrieval for Ranked Query (EIRQ), in which queries are classified into multiple ranks, where a high percentage of matched files can retrieved by higher ranked query. The simple idea of EIRQ is to construct a privacy-preserving mask matrix which makes the cloud to filter certain percentage of matched files before returning to the ADL for aggregation. This is not a trivial work, since the cloud needs to correctly filter out files according to the rank of queries without knowing anything about user privacy. By allowing the users to retrieve matched files on demand, the bandwidth consumed in the cloud can be largely reduced. We provide two solutions to adjust related parameters; one is based on the Ostrovsky scheme, and the other is based on Bloom filters.

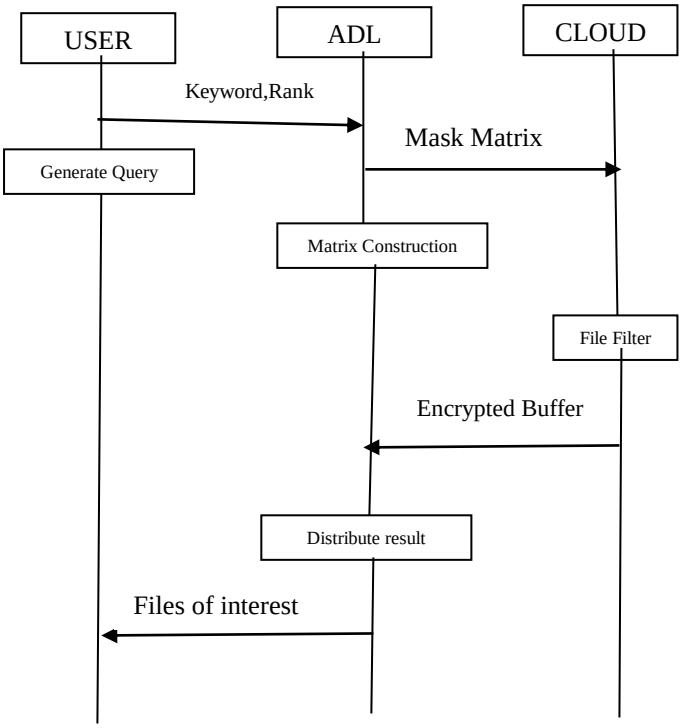

Figure 2: The EIRQ Scheme

5. Results & Discussion

The EIRQ schemes follows the comparison of the computational/communication cost, file survival rates incurred on the clouds with different information retrieval schemes. File survival rates give the probability of retrieving the desired file for a user using Ostrovsky scheme and our model. Here the queries are classifies into 0~4 ranks Rank 0 to Rank 4. These ranks retrieve files of the user interest with the percentages of 100%, 75%, 50%, 25%, 0%.

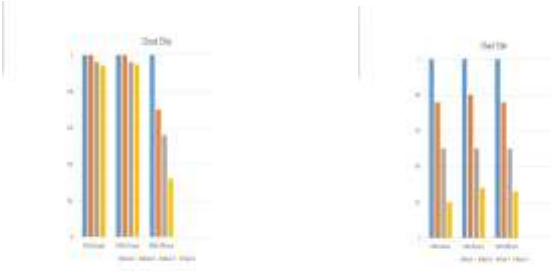

Figure 3: File Survival Rate under Bloom Filter Setting

The no. of exponentiations performed by the cloud is mainly determined as computational costs. These are almost in similar order for Ostrovsky parameter settings. To justify the simplification, we compare the No-Rank and three EIRQ algorithms.

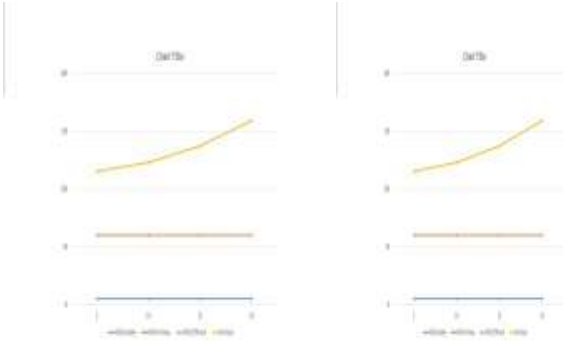

Figure 4: Comparison of computational cost
The X axis denotes queries in each rank, Y axis denotes Computational cost

6. Future Enhancement

The differential queries in EIRQ scheme provides the required services by using cloud infrastructure. In this paper, we intended to enhance the experience to new customers and global markets by helping the partners augment their cloud contribution. These scheme consists of set of tools such as Platform as Service and Software as Service vendors that provides services which includes Application, Database, Development & Management. It offers software, applications and cloud services on top of the public cloud.

EIRQ protocol is the efficient than Ostrovosky, COPS scheme as it addresses issues of privacy, aggregation and network bandwidth usage. The EIRQ can be further enhanced in future in certain aspects like:

1. Ranking of the files depends upon the highest rank of queries that matches the interested file. This kind of ranking leaves few bottlenecks, a sophisticated ranking system can be developed by providing attributes to each file.

2. In EIRQ algorithm, the privacy preserving mask matrix has a row for each keyword in organization directory which threats the scalability of organization that has dictionaries with thousands of keywords. Still a reliable version of this algorithm can be proposed to compress the size of matrix.

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