

Enhanced Synonym Queries Supported Encrypted Cloud Multi-Keyword Ranked Search System

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ABSTRACT: *As an enhancement we enhance the existing system and in this paper we propose an effective approach to solve the problem of multi-keyword ranked search over encrypted cloud data supporting synonym queries. The main contribution of this paper is summarized in two aspects: multi-keyword ranked search to achieve more accurate search results and synonym-based search to support synonym queries. Meanwhile, existing search approaches over encrypted cloud data support only exact or fuzzy keyword search, but not semantics-based multi-keyword ranked search. Therefore, how to enable an effective searchable system with support of ranked search remains a very challenging problem.*

are many alternatives for the message passing mechanism, including RPC-like connectors and message queues. Three significant characteristics of distributed systems are: concurrency of components, lack of a global clock, and independent failure of components. An important goal and challenge of distributed systems is location transparency. Examples of distributed systems vary from SOA-based systems to massively multiplayer online games to peer-to-peer applications. A computer program that runs in a distributed system is called a distributed program, and distributed programming is the process of writing such programs. Distributed computing also refers to the use of distributed systems to solve computational problems.

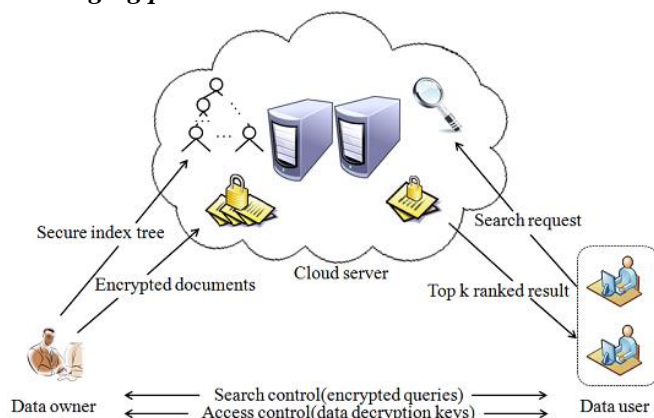


FIG 1: SYSTEM ARCHITECTURE

I. INTRODUCTION

Distributed computing is a field of computer science that studies distributed systems. A distributed system is a software system in which components located on networked computers communicate and coordinate their actions by passing messages. The components interact with each other in order to achieve a common goal. There

In distributed computing, a problem is divided into many tasks, each of which is solved by one or more computers, which communicate with each other by message passing. The word *distributed* in terms such as "distributed system", "distributed programming", and "distributed algorithm" originally referred to computer networks where individual computers were physically distributed within some geographical area. The terms are nowadays used in a much wider sense, even referring to autonomous processes that run on the same physical computer and interact with each other by message passing. While there is no single definition of a distributed system, the following defining properties are commonly used: There are several autonomous computational entities, each of which has its own local memory. The entities communicate with each other by message passing. In this article, the computational entities are called *computers* or *nodes*. A distributed system may have a common goal, such as solving a large computational problem. Alternatively, each computer

may have its own user with individual needs, and the purpose of the distributed system is to coordinate the use of shared resources or provide communication services to the users. Other typical properties of distributed systems include the following: The system has to tolerate failures in individual computers. The structure of the system (network topology, network latency, number of computers) is not known in advance, the system may consist of different kinds of computers and network links, and the system may change during the execution of a distributed program. Each computer has only a limited, incomplete view of the system. Each computer may know only one part of the input.

II. RELATED WORK:

Distributed systems are groups of networked computers, which have the same goal for their work. The terms "concurrent computing", "parallel computing", and "distributed computing" have a lot of overlap, and no clear distinction exists between them. The same system may be characterised both as "parallel" and "distributed"; the processors in a typical distributed system run concurrently in parallel. Parallel computing may be seen as a particular tightly coupled form of distributed computing, and distributed computing may be seen as a loosely coupled. The effective data retrieval need, the large amount of documents demand the cloud server to perform result relevance ranking, instead of returning undifferentiated results. Such ranked search system enables data users to find the most relevant information quickly, rather than burdensomely sorting through every match in the content collection. Ranked search can also elegantly eliminate unnecessary network traffic by sending back only the most relevant data, which is highly desirable in the "pay-as-you-use" cloud paradigm.

For privacy protection, such ranking operation, however, should not leak any keyword related information. On the other hand, to improve the search result accuracy as well as to enhance the user searching experience, it is also necessary for such ranking system to support multiple keywords search, as single keyword search often yields far too coarse results. In this paper, for the first time, we define and solve the problem of multi-keyword ranked

search over encrypted cloud data (MRSE) while preserving strict system wise privacy in the cloud computing paradigm. Among various multi-keyword semantics, we choose the efficient similarity measure of "coordinate matching," i.e., as many matches as possible, to capture the relevance of data documents to the search query. Specifically, we use "inner product similarity", i.e., the number of query keywords appearing in a document, to quantitatively evaluate such similarity measure of that document to the search query. During the index construction, each document is associated with a binary vector as a sub-index where each bit represents whether corresponding keyword is contained in the document.

The search query is also described as a binary vector where each bit means whether corresponding keyword appears in this search request, so the similarity could be exactly measured by the inner product of the query vector with the data vector. However, directly outsourcing the data vector or the query vector will violate the index privacy or the search privacy. To meet the challenge of supporting such multi keyword semantic without privacy breaches, we propose a basic idea for the MRSE using secure inner product computation, which is adapted from a secure k-nearest neighbor (kNN) technique, and then give two significantly improved MRSE schemes in a step-by-step manner to achieve various stringent privacy requirements.

III. SYSTEM PRELIMINARIES:

A. DATA USER MODULE

This module includes the user registration login details.

B. DATA OWNER MODULE

This module helps the owner to register those details and also include login details.

C. FILE UPLOAD MODULE

This module helps the owner to upload his file with encryption using RSA algorithm. This ensures the files to be protected from unauthorized user.

D. RANK SEARCH MODULE

These modules ensure the user to search the files that are searched frequently using rank search.

E. FILE DOWNLOAD MODULE

This module allows the user to download the file using his secret key to decrypt the downloaded data.

F. VIEW UPLOADED AND DOWNLOADED FILE

This module allows the Owner to view the uploaded files and downloaded files

IV. CONCLUSION

In this paper, for the first time we define and solve the problem of multi-keyword ranked search over encrypted cloud data, and establish a variety of privacy requirements. Among various multi-keyword semantics, we choose the efficient similarity measure of “coordinate matching,” i.e., as many matches as possible, to effectively capture the relevance of outsourced documents to the query keywords, and use “inner product similarity” to quantitatively evaluate such similarity measure. For meeting the challenge of supporting multi-keyword semantic without privacy breaches, we propose a basic idea of MRSE using secure inner product computation. Then, we give two improved MRSE schemes to achieve various stringent privacy requirements in two different threat models.

We also investigate some further enhancements of our ranked search mechanism, including supporting more search semantics, i.e., TF_IDF, and dynamic data operations. Thorough analysis investigating privacy and efficiency guarantees of proposed schemes is given, and experiments on the real-world data set show our proposed schemes introduce low overhead on both computation and communication. In our future work, we will explore checking the integrity of the rank order in the search result assuming the cloud server is untrusted.

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