A STUDY ON SECURE AND DYNAMIC MULTI-KEYWORD RANKED SEARCH SCHEME OVER ENCRYPTED CLOUD DATA

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Abstract

Due to the increasing popularity of cloud computing, more and more data owners are motivated to outsource their data to cloud servers for great convenience and reduced cost in data management. However, sensitive data should be encrypted before outsourcing for privacy requirements, which obsoletes data utilization like keyword-based document retrieval. In this paper, we present a secure multi-keyword ranked search scheme over encrypted cloud data, which simultaneously supports dynamic update operations like deletion and insertion of documents. Specifically, the vector space model and the widely-used TF_IDF model are combined in the index construction and query generation. We construct a special tree-based index structure and propose a "Greedy Depth-first Search" algorithm to provide efficient multi- keyword ranked search. The secure kNN algorithm is utilized to encrypt the index and query vectors, and meanwhile ensure accurate relevance score calculation between encrypted index and query vectors. In order to resiststatistical attacks, phantom terms are added to the index vector for blinding search results. Due to the use of our special tree-based index structure, the proposed scheme can achieve sub-linear search time and deal with the deletionand insertion of documents flexibly. Extensive experiments are conducted to demonstrate the efficiency of the proposed scheme.

Key Words: Dynamic, Multi-keyword, Ranked Search, Encrypted Cloud Data.

1. Introduction

Now a day's cloud computing has become essential for many utilities, where cloud customers can slightly store their data into the cloud so as to benefit from on-demand high-quality request and services from a shared pool of configurable computing resources. Its huge suppleness and financial savings are attracting both persons and enterprise to outsource their local complex data management system into the cloud. To safe guard data privacy and struggle unwanted accesses in the cloud and away from, sensitive data, for example, emails, personal health records, photo albums, videos, land documents, financial transactions, and so on, may have to be encrypted by data holder before outsourcing to the business public cloud; on the other hand, obsoletes the traditional data use service based on plaintext keyword search. The insignificant solution of downloading all the information and decrypting nearby is clearly impossible, due to the enormous amount of bandwidth cost in cloud scale systems. Furthermore, apart from eradicating the local storage management, storing data into the cloud supplies no purpose except they can be simply searched and operated. Thus, discovering privacy preserving and effective search service over encrypted cloud data is one of the supreme importance. In view of the potentially large number of on-demand data users and vast amount of outsourced data documents in the cloud, this difficulty is mostly demanding as it is really difficult to gather the requirements of performance, system usability, and scalability.

On the one hand, to congregate the efficient data retrieval requirement, the huge amount of documents orders the cloud server to achieve result relevance ranking, as an alternative of returning undifferentiated results. Such ranked search system allows data users to discover the most appropriate information quickly, rather than burdensomely sorting during every match in the content group. Ranked search can also gracefully remove redundant network traffic by transferring the most relevant data, which is highly attractive in the “pay-as-you-use” cloud concept. For privacy protection, such ranking operation on the other hand, should not reveal any keyword to related information. To get better the search result exactness as well as to improve the user searching experience, it is also essential for such ranking system to support multiple keywords search, as single keyword search often give up far too common results. As a regular practice specifies by today’s web search engines i,e Google search, data users may lean to offer a set of keywords as an alternative of only one as the indicator of their search interest to retrieve the most relevant data. And each keyword in the search demand is able to help narrow down the search result further. “Coordinate matching”, as many matches as possible, is an efficient resemblance measure among such multi keyword semantics to refine the result significance, and has been widely used in the plaintext information retrieval (IR) community. Though, the nature of applying encrypted cloud data search system remains a very demanding task in providing security and maintaining privacy, like the data privacy, the index privacy, the keyword privacy, and many others. Encryption is a helpful method that treats encrypted data as documents and allows a user to securely search through a single keyword and get back documents of interest. On the other hand, direct application of these approaches to the secure large scale cloud data utilization system would not be necessarily suitable, as they are developed as crypto primitives and cannot put up such high service-level needs like system usability, user searching experience, and easy information discovery.

Purpose

Proposed cloud storage systems that offer privacy, reliability and authentication of client data against a untrusted cloud provider. This OTP used to see data in cloud and it can be used once only in a time, when you search a file and want to see the file, the OTP will send to the email or to the phone and getting the OTP use the OTP to utilize the file . Presently in the existing system the cloud server hosts third-party data storage and get back services. As information may have sensitive information, the cloud servers cannot be fully hand over in protecting data. For this cause, outsourced files must be encrypted. Any type of data leakage that would involve data privacy is considered as undesirable.

2. Literature Survey

Security challenges for the public:

Authors: K. Ren, C.Wang,Q.Wang et al.,

Cloud computing represents today's most exciting computing paradigm shift in information technology. However, security and privacy are perceived as primary obstacles to its wide adoption. Here, the authors outline several critical security challenges and motivate further investigation of security solutions for a trustworthy public cloud environment.

Public key encryption with keyword search

Authors**:** D. Boneh, G. Di Crescenzo, R. Ostrovsky, and G. Persiano

We study the problem of searching on data that is encrypted using a public key system. Consider user Bob who sends email to user Alice encrypted under Alice's public key. An email gateway wants to test whether the email contains the keyword "urgent" so that it could route the email accordingly. Alice, on the other hand does not wish to give the gateway the ability to decrypt all her messages. We define and construct a mechanism that enables Alice to provide a key to the gateway that enables the gateway to test whether the word "urgent" is a keyword in theemail without learning anything else about the email. We refer to this mechanism as Public Key Encryption with keyword Search. As another example, consider a mail server that stores various messages publicly encrypted for Alice by others. Using our mechanism Alice can send the mail server a key that will enable the server to identify all messages containing some specific keyword, but learn nothing else. We define the concept of public key encryption with keyword search and give several constructions.

3. Discussions and Materials

A. System Analysis

The **Systems Development Life Cycle (SDLC)**, or Software Development Life Cycle in systems engineering, information systems and software engineering, is the process of creating or altering systems, and the models and methodologies that people use to develop these systems. In software engineering the SDLC concept underpins many kinds of software development methodologies. These methodologies form the framework for planning and controlling the creation of an information system the software development process.

Software Development Life Cycle

The ideas about the software development life cycle (SDLC) have been around for a long time and many variations exist, such as the waterfall, and the V-model. These variations have many versions varying from those which are just guiding principles, to rigid systems of development complete with processes, paperwork, and people roles. However underlying all these are a set of common principles.

SDLC Common Principles

The common principles behind the SDLC are

1. The process of developing software consists of a number of phases.
2. These phases are arranged in a precedence sequence of when they start.
3. The sequence of phases represents the passage through time of the software development.
4. Phases can and do overlap as previous phases are revisited, when more information becomes available.
5. The software becomes more complex and useful as the phases are followed.

These principles apply to whichever particular variation of the SDLC is looked at, with emphasisbeing placed on particular principles in each variation

SDLC Common Phases

As you look at the various methods they all have a number of particular phases they recommend. On my V-Model page I show a specific set of phases. This set is practical, but is not the definitive answer for all software development. The V-Model example is just to demonstrate the issues to be considered in development and how they affect each other.

We propose the "4D" model as a generic model for understanding the larger issues. This has four phases*:*

1. Decide – What is it you want to build in software?
2. Design – How will you map these decisions to a software environment?
3. Develop – Build the software according to the designs.
4. Demonstrate – Prove that the software delivers what was required.

Decide Phase

The Decide phase covers all those activities involved in deciding what it is that you want to build. The products from this phase typically include:

1. Business cases to justify what is wanted in terms of business benefit.
2. Feature lists of what is wanted to be included to deliver that benefit.
3. Use Cases to explore how the features would work together.
4. Non-functional requirements are the performance and development constraints placed onthe system.
5. System Specification which maps between what is wanted in the real world and what is possible in a computer system.

This phase is frustrating one – it is necessary but it can be perceived as delaying the eventual system. Also it requires a large commitment of user's time to decide this, often while they are involved in doing their normal day job. As a result many projects have a poor set of deliverables from the Decide phase before the Design phase starts. If however there is a process to allow modification of these products throughout the project then the Decide products will improve.

Design Phase

The Design phase takes the products from the Decide phase and creates a design of the architecture and detail working of how the software system will deliver what is wanted. The key thing to note is that despite many efforts over the years there is no automatic way of deriving the Design products from the Decide products. Where this has been claimed before inevitably it has been by restricting the way the Decide products are written and forcing them to be expressed in the form of a computer design. However it is possible, and necessary, to compare the Design products with the Decide products to see if what is wanted has been included. The Design phase is done by the analyst and design team who should work closely with developers in the Develop team.

Develop Phase

The Develop phase is what most users consider to be what software development is about. Paradoxically in many ways it is the least important of the phases, even though it will consume a lot of the resources. The reason is that most systems are constructed from a set of standard parts with some configuration, some customization, and some bespoke parts to make the system unique. These decisions would have been taken in the Design phase, and in the Develop phase the work of converting them into a software system takes place. The products from this phase then have to be shown to work.

Demonstrate Phase

The Demonstrate phase is about proving that the delivered system works and is what was wanted. This phase is not just about testing but contains activities such as document reviews and code walkthroughs. It has a high degree of overlap with the other phases as the earlier you can catch a problem results in higher quality in the final product. This phase is done by both the developers and the users.

She has called these four phases a "4D" model as it implies it is multi-dimensional including a time dimension. However these models are always depicted as a two-dimensional diagram and as a result some of the universal features of a SDLC are obscured or lost.

Diagram 1 - 4D SDLC - is a non-standard way of showing a SDLC showing several of the principles including

1. There are four phases representing different things to be done.
2. The phases follow each other in sequence shown by the overlap and moving up thecomplexity and time scales.
3. They move along the time scale.
4. Phases overlap implying that there is no fixed finish between the start of one phase and the start of the next. It also implies that previous phases are revisited when further information is found.
5. The phases rising up imply both increasing complexity and also the amount of effort required to reach a final product.

Comparing this against the 5 principles shows

1. It also clearly shows the four phases.
2. It also shows the precedence order.
3. They also move along the time scale.
4. However the diagram implies that there is a clear finish of each phase before the next starts. Very few Software Development Life Cycles recommend this, but this is the impression the diagram gives.
5. The products falling down give the visual impression of little effort being required, nor does it give an impression of the greater complexity being built up.

SDLC Methodology

This document play a vital role in the development of life cycle (SDLC) as it describes the complete requirement of the system. It means for use by developers and will be the basic during testing phase. Any changes made to the requirements in the future will have to go through formal change approval process.

SPIRAL MODEL was defined by Barry Boehm in his 1988 article, "A spiral Model of Software Development and Enhancement. This model was not the first model to discuss iterative development, but it was the first model to explain why the iteration models.

As originally envisioned, the iterations were typically 6 months to 2 years long. Each phase starts with a design goal and ends with a client reviewing the progress thus far. Analysis and engineering efforts are applied at each phase of the project, with an eye toward the end goal of the project.

The steps for Spiral Model can be generalized as follows:

- The new system requirements are defined in as much details as possible. This usually involves interviewing a number of users representing all the external or internal users andother aspects of the existing system.
- A preliminary design is created for the new system.
- A first prototype of the new system is constructed from the preliminary design. This is usually a scaled-down system, and represents an approximation of the characteristics of the final product.

A second prototype is evolved by a fourfold procedure

1. Evaluating the first prototype in terms of its strengths, weakness, and risks.
2. Defining the requirements of the second prototype.
3. Planning a designing the second prototype.
4. Constructing and testing the second prototype.
5. At the customer option, the entire project can be aborted if the risk is deemed too great. Risk factors might involve development cost overruns, operating-costmiscalculation, or any other factor that could, in the customer's judgment, result in a less-than-satisfactory final product.
6. The existing prototype is evaluated in the same manner as was the previous prototype, and if necessary, another prototype is developed from it according to the fourfold procedure outlined above.
7. The preceding steps are iterated until the customer is satisfied that the refined prototype represents the final product desired.
8. The final system is constructed, based on the refined prototype.
9. The final system is thoroughly evaluated and tested. Routine maintenance is carried on a continuing basis to prevent large scale failures and to minimize down time.

Advantages

1. Estimates (i.e. budget, schedule etc .) become more realistic as work progresses, because important issues discovered earlier.
2. It is more able to cope with the changes that are software development generally entails.
3. Software engineers can get their hands in and start working on the core of a project earlier.

Existing System

- A general approach to protect the data confidentiality is to encrypt the data before outsourcing.
- Searchable encryption schemes enable the client to store the encrypted data to the cloud and execute keyword search over cipher text domain. So far, abundant works have been proposed under different threat models to achieve various search functionality, such as single keyword search, similarity search, multi-keyword Boolean search, ranked search, Multi - keyword ranked search, etc. Among them, multi-keyword ranked search achieves more and more attention for its practical applicability. Recently, some *dynamic* schemes have been proposed to support inserting and deleting operations on document collection. These are significant works as it is highly possible that the data owners need to update their data on the cloud server.

Disadvantages of Existing System

- Huge cost in terms of data usability. For example, the existing techniques on keyword-based information retrieval, which are widely used on the plaintext data, cannot be directly applied on the encrypted data. Downloading all the data from the cloud and decrypt locally is obviously impractical.
- Existing System methods not practical due to their high computational overhead for both the cloud sever and user.

Proposed System

This paper proposes a secure tree-based search scheme over the encrypted cloud data, which supports multi-keyword ranked search and dynamic operation on the document collection. Specifically, the vector space model and the widely-used “term frequency (TF) ×inverse document frequency (IDF)” model are combined in the index construction and query generation to provide multi-keyword ranked search. In order to obtain high search efficiency,we construct a tree-based index structure and propose a “Greedy Depth-first Search” algorithm based on this index tree.

Advantages of Proposed System

- Due to the special structure of our tree-based index, the proposed search scheme can flexibly achieve sub-linear search time and deal with the deletion and insertion of documents.
- We design a searchable encryption scheme that supports both the accurate multi-keyword ranked search and flexible dynamic operation on document collection.
- Due to the special structure of our tree-based index, the search complexity of the proposed scheme is fundamentally kept to logarithmic. And in practice, the proposed scheme can achieve higher search efficiency by executing our “Greedy Depth-first Search” algorithm. Moreover, parallel search can be flexibly performed to further reduce the time cost of search process.

B. System Requirements Specification

A **Software Requirements Specification** (**SRS**) – a requirements specification for a software system – is a complete description of the behavior of a system to be developed. It includes a set of use cases that describe all the interactions the users will have with the software. In addition to use cases, the SRS also contains non-functional requirements. Non-functional requirements are requirements which impose constraints on the design or implementation (such as performance engineering requirements, quality standards, or design constraints).

System requirements specification: A structured collection of information that embodies the requirements of a system. A business analyst, sometimes titled system analyst, is responsible for analyzing the business needs of their clients and stakeholders to help identify business problems and propose solutions. Within the systems development life cycle domain, the BA typically performs a liaison function between the business side of an enterprise and the information technology department or external service providers. Projects are subject to three sorts of requirements:

1. Business requirements describe in business terms what must be delivered or accomplished to provide value.
2. Product requirements describe properties of a system or product (which could be one of several ways to accomplish a set of business requirements.)
3. Process requirements describe activities performed by the developing organization. For instance, process requirements could specify specific methodologies that must be followed, and constraints that the organization must obey.

Product and process requirements are closely linked. Process requirements often specify the activities that will be performed to satisfy a product requirement. For example, a maximum development cost requirement (a process requirement) may be imposed to help achieve a maximum sales price requirement (a product requirement); a requirement that the product be maintainable (a Product requirement) often is addressed by imposing requirements to follow particular development styles.

In software engineering, the same meanings of requirements apply, except that the focus of interest is the software itself.

Hardware Requirements:

System	: Pentium IV 2.4 GHz.
Hard Disk	: 40 GB.
Floppy Drive	: 1.44 Mb.
Monitor	: 15 VGA Colour.
Mouse	: Logitech.
Ram	: 512 Mb.

Software Requirements:

Operating system:	- Windows 7.
Coding Language :	J2EE
Data Base :	MYSQL

Technology Description
Java Technology: Java technology is both a programming language and a platform.

The Java Programming Language
The Java programming language is a high-level language that can be characterized by allof the following buzzwords:

Simple
Object oriented
Portable
High performance
Interpreted
Multithreaded
Robust
Dynamic
Secure

Java Source Code and Destination Code
You can think of Java byte codes as the machine code instructions for the *Java Virtual Machine* (Java VM). Every Java interpreter, whether it's a development tool or a Web browser that can run applets, is an implementation of the Java VM. Java byte codes help make "write once, run anywhere" possible. You can compile your program into byte codes on any platform that has a Java compiler. The byte codes can then be run on any implementation of the Java VM.

That means that as long as a computer has a Java VM, the same program written in the Java programming language can run on Windows 2000, a Solaris workstation, or on an iMac.

The Java Platform
A platform is the hardware or software environment in which a program runs. We've already mentioned some of the most popular platforms like Windows 2000, Linux, Solaris, and MacOS. Most platforms can be described as a combination of the operating system and hardware. The Java platform differs from most other platforms in that it's a software-only platform that runs on top of other hardware-based platforms.

The Java Platform Has Two Components

- The Java Virtual Machine (JavaVM)
- The Java Application Programming Interface (Java API)

You've already been introduced to the Java VM. It's the base for the Java platform and isported onto various hardware-based platforms.

The following figure depicts a program that's running on the Java platform. As the figureshows, the Java API and the virtual machine insulate the program from the hardware.

Native code is code that after you compile it, the compiled code runs on a specific hardware platform. As a platform-independent environment, the Java platform can be a bit slower than native code. However, smart compilers, well-tuned interpreters, and just-in-time byte code compilers can bring performance close to that of native code without threatening portability.

How does the API support all these kinds of programs? It does so with packages of software components that provides a wide range of functionality. Every full implementation of the Java platform gives you the following features:

The essentials: Objects, strings, threads, numbers, input and output, data structures, system properties, date and time, and so on.

Applets: The set of conventions used by applets.

Networking: URLs, TCP (Transmission Control Protocol), UDP (User Data gram Protocol) sockets, and IP (Internet Protocol) addresses.

Internationalization: Help for writing programs that can be localized for users worldwide. Programs can automatically adapt to specific locales and be displayed in the appropriate language.

Security: Both low level and high level, including electronic signatures, public and private key management, access control, and certificates.

Software components: Known as JavaBeans ^{TM}, can plug into existing component architectures.

Object serialization: Allows lightweight persistence and communication via Remote Method Invocation (RMI).

Java Database Connectivity (JDBC^{TM}): Provides uniform access to a wide range of relational databases.

The Java platform also has APIs for 2D and 3D graphics, accessibility, servers, collaboration, telephony, speech, animation, and more. The following figure depicts what is included in the Java 2 SDK.

ODBC

Microsoft Open Database Connectivity (ODBC) is a standard programming interface for application developers and database systems providers. Before ODBC became a de facto standard for Windows programs to interface with database systems, programmers had to use proprietary languages for each database they wanted to connect to. Now, ODBC has made the choice of the database system almost irrelevant from a coding perspective, which is as it should be. Application developers have much more important things to worry about than the syntax that is needed to port their program from one database to another when business needs suddenly change.

The advantages of this scheme are so numerous that you are probably thinking there must be some catch. The only disadvantage of ODBC is that it isn't as efficient as talking directly to the native database interface. ODBC has had many detractors make the charge that it is too slow. Microsoft has always claimed that the critical factor in performance is the quality of the driver software that is used. In our humble opinion, this is true. The availability of good ODBCdrivers has improved a great deal recently. And anyway, the criticism about performance is somewhat analogous to those who said that compilers would never match the speed of pure assembly language. Maybe not, but the compiler (or ODBC) gives you the opportunity to write cleaner programs, which means you finish sooner. Meanwhile, computers get faster every year.

JDBC

In an effort to set an independent database standard API for Java; Sun Microsystems developed Java Database Connectivity, or JDBC. JDBC offers a generic SQL database access mechanism that provides a consistent interface to a variety of RDBMSs. This consistent interface is achieved through the use of "plug-in" database connectivity modules, or drivers. If a database vendor wishes to have JDBC support, he or she must provide the driver for each platform that thedatabase and Java run on.

JDBC was announced in March of 1996. It was released for a 90 day public review that ended June 8, 1996. Because of user input, the final JDBC v1.0 specification was released soon after.

JDBC Goals

Few software packages are designed without goals in mind. JDBC is one that, because of its many goals, drove the development of the API. These goals, in conjunction with early reviewer feedback, have finalized the JDBC class library into a solid framework for building database applications in Java.

The goals that were set for JDBC are important. They will give you some insight as to why certain classes and functionalities behave the way they do. The eight design goals for JDBC are as follows:

1. **SQL Level API**
   The designers felt that their main goal was to define a SQL interface for Java. Although not the lowest database interface level possible, it is at a low enough level for higher-level tools and APIs to be created. Conversely, it is at a high enough level for application programmers to use it confidently. Attaining this goal allows for future tool vendors to "generate" JDBC code and to hide many of JDBC's complexities from the end user.

2. **SQL Conformance**
   SQL syntax varies as you move from database vendor to database vendor. In an effort to support a wide variety of vendors, JDBC will allow any query statement to be passed through it

to the underlying database driver. This allows the connectivity module to handle non- standard functionality in a manner that is suitable for its users.

3. **JDBC must be implemental on top of common database interfaces** The JDBC SQL API must "sit" on top of other common SQL level APIs. This goal allows JDBC to use existing ODBC level drivers by the use of a software interface. This interface would translate JDBC calls to ODBC and vice versa.
4. **Provide a Java interface that is consistent with the rest of the Java system**
   Because of Java's acceptance in the user community thus far, the designers feel that they should not stray from the current design of the core Java system.
5. **Keep it simple**
   This goal probably appears in all software design goal listings. JDBC is no exception. Sun felt that the design of JDBC should be very simple, allowing for only one method of completing a task per mechanism. Allowing duplicate functionality only serves to confuse the users of the API.
6. **Use strong, static typing wherever possible**
   Strong typing allows for more error checking to be done at compile time; also, less error appear at runtime.
7. **Keep the common cases simple**
   Because more often than not, the usual SQL calls used by the programmer are simple SELECT's, INSERT's, DELETE's and UPDATE's, these queries should be simple to perform with JDBC. However, more complex SQL statements should also be possible.

Finally we decided to proceed the implementation using Java **Networking.** And for dynamically updating the cache table we go for MS **Access** database.
Java ha two things: a programming language and a platform.
Java is a high-level programming language that is all of the following

Simple
Object-oriented
Distributed
Interpreted
Robust
Secure
Architecture-neutral
Portable
High-performance
multithreaded
Dynamic

Java is also unusual in that each Java program is both compiled and interpreted. With a compile you translate a Java program into an intermediate language called Javabyte codes the platform-independent code instruction is passed and run on the computer.

Compilation happens just once; interpretation occurs each time the program is executed. The figure illustrates how this works.

You can think of Java byte codes as the machine code instructions for the Java Virtual Machine (Java VM). Every Java interpreter, whether it's a Java development tool or a Web browser that can run Java applets, is an implementation of the Java VM.The Java VM can also be implemented in hardware.

Java byte codes help make "write once, run anywhere" possible. You can compile your Java program into byte codes on my platform that has a Java compiler. The byte codes can then be run any implementation of the Java VM. For example, the same Java program can run Windows NT, Solaris, and Macintosh.

C. System Design

Input Design

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

Objectives

1. Design is the process of converting a user-oriented description of the input into a computer- based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.
2. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.
3. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow.

Output Design

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people willfind the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2. Select methods for presenting information.
3. Create document, report, or other formats that contain information produced by the system.
4. The output form of an information system should accomplish one or more of the followingobjectives.
    - Convey information about past activities, current status or projections of the future.
    - Signal important events, opportunities, problems, or warnings.
    - Trigger an action.
    - Confirm an action.

Data Flow Diagram

1. The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carriedout on this data, and the output data is generated by this system.
2. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.
3. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.
4. DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

UML Diagrams

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed,and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

Goals

The Primary goals in the design of the UML are as follows

1. Provide users a ready-to-use, expressive visual modeling Language sothat they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the coreconcepts.
3. Be independent of particular programming languages and developmentprocess.
4. Provide a formal basis for understanding the modeling language.
5. Encourage the growth of OO tools market.
6. Support higher level development concepts such as collaborations,frameworks, patterns and components.
7. Integrate best practices.

Use Case Diagram

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors inthe system can be depicted.

Class Diagram

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.

Sequence Diagram

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.

Activity Diagram

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

D. System Implementation

Modules

- Data Owner Module
- Data User Module
- Cloud server and Encryption Module
- Rank Search Module

Modules Description

Data Owner Module

This module helps the owner to register those details and also include login details. This module helps the owner to upload his file with encryption using RSA algorithm. This ensures the files to be protected from unauthorized user. Data owner has a collection of documents $F =\{f1; f2; :::; fn\}$ that he wants to outsource to the cloud server in encrypted form while still keeping the capability to search on them for effective utilization. In our scheme, the data owner firstly builds a secure searchable tree index I from document collection F, and then generates an encrypted document collection C for F. Afterwards, the data owner outsources the encrypted collection and the secure index I to the cloud server, and securely distributes the key information of trapdoor generation and document decryption to the authorized data users. Besides, the data owner is responsible for the update operation of his documents stored in the cloud server. While updating, the data owner generates the update information locally and sends it to the server.

Data User Module

This module includes the user registration login details.This module is used to help the client to search the file using the multiple key words concept and get the accurate result list based on the user query. The user is going to select the required file and register the user details and get activation code in mail email before enter the activation code. After user can download the Zip file and extract that file.Data user are authorized ones to access the documents of data owner. With t query keywords, the authorized user can generate a trapdoor TD according to search control mechanisms to fetch k encrypted documents from cloud server. Then, the data user and encrypt the documents with the shared secret key.

Cloud Server and Encryption Module

This module is used to help the server to encrypt the document using RSA Algorithm andto convert the encrypted document to the Zip file with activation code and then activation code send to the user for download. Cloud server stores the encrypted document collection and the encrypted searchable tree index *I* for data owner. Upon receiving the trapdoor *TD* from the data user, the cloud server executes search over the index tree *I*, and finally returns the corresponding collection of top-*k* ranked encrypted documents. Besides, upon receiving the update information from the data owner, the server needs to update the index *I* and document collection *A*ccording tothe received information. The cloud server in the proposed scheme is considered as "honest-but- curious", which is employed by lots of works on secure cloud data search.

Rank Search Module

These modules ensure the user to search the files that are searched frequently using rank search. This module allows the user to download the file using his secret key to decrypt the downloaded data. This module allows the Owner to view the uploaded files and downloaded files. The proposed scheme is designed to provide not only multi-keyword query and accurate result ranking, but also dynamic update on document collections. The scheme is designed to prevent the cloud server from learning additional information about the document collection, the index tree, and the query.

Conclusion and Scope of the Work

In this paper, a secure, efficient and dynamic search scheme is proposed, which supports not only the accurate multi-keyword ranked search but also the dynamic deletion and insertion of documents. We construct special keyword balanced binary tree as the index, and propose a "Greedy Depth-first Search" algorithm to obtain better efficiency than linear search. In addition, the parallel search process can be carried out to further reduce the time cost. The security of the scheme is protected against two threat models by using the secure KNN algorithm. Experimental results demonstrate the efficiency of our proposed scheme. There are still many challenge problems in symmetric schemes. In the proposed scheme, the data owner is responsible for generating updating information and sending them to the cloud server.

Thus, the data owner needs to store the unencrypted index tree and the information that are necessary to recalculate the IDF values. Such an active data owner may not be very suitable forth cloud computing model. It could be a meaningful but difficult future work to design a dynamic searchable encryption scheme whose updating operation can be completed by cloud server only, meanwhile reserving the ability to support multi-keyword ranked search. In addition, as the most of works about searchable encryption, our scheme mainly considers the challenge from the cloud server. Actually, there are many secure challenges in a multi-user scheme. Firstly, all the users usually keep the same secure key for trapdoor generation in asymmetric SE scheme. In this case, the revocation of the user is big challenge. If it is needed to revoke a user in this scheme, we need to rebuild the index and distribute the new secure keys to all the authorized users. Secondly, symmetric SE schemes usually assume that all the data users are trustworthy. It is not practical and a dishonest data user will lead to many secure problems. For example, a dishonest data user may search the documents and distribute the decrypted documents to the unauthorized ones.

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