Secured Load Balancing Model based on Cloud Partitioning using Round Robin Algorithm for the Public Cloud in Cloud Computing

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Abstract

Load balancing in the cloud computing environment has an important impact on the performance. Good load balancing makes cloud computing more efficient and improves user satisfaction. This article introduces a better load balance model for the public cloud based on the cloud partitioning concept with a switch mechanism to choose different strategies for different situations. The algorithm applies the game theory to the load balancing strategy to improve the efficiency in the public cloud environment

***Keywords*:** Load balancing, Best partition searching, First Come First Served (FCFS) rules, Round Robin Algorithm, Cloud partitioning, Game Theory.

1. Introduction

Cloud computing is an attracting technology in the field of computer science. In Gartner's report, it says that the cloud will bring changes to the IT industry. The cloud is changing our life by providing users with new types of services. Users get service from a cloud without paying attention to the details. NIST gave a definition of cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. More and more people pay attention to cloud computing. Cloud computing is efficient and scalable but maintaining the stability of processing so many jobs in the cloud computing environment is a very complex problem with load balancing receiving much attention for researchers. Good load balance will improve the performance of the entire cloud. However, there is no common method that can adapt to all possible different situations. Various methods have been developed in improving existing solutions to resolve new problems. Each particular method has advantage in a particular area but not in all situations. Therefore, the current model integrates several methods and switches between the load balance methods based on the system status. A relatively simple method can be used for the partition idle state with a more complex method for the normal state. The load balancers then switch methods as the status changes. Here, the idle status uses an improved Round Robin algorithm while the normal status uses a game theory based load balancing strategy.

1.1. Cloud Computing

Cloud computing provides massive computation power and storage capacity which enable users to deploy computation and data-intensive applications without infrastructure investment. Along the processing of such applications, a large volume of intermediate data sets will be generated, and often stored to save the cost of re computing them. However, preserving the privacy of intermediate data sets becomes a challenging problem because adversaries may recover privacy-sensitive information by analyzing multiple intermediate data sets. Encrypting all data sets in cloud is widely adopted in existing approaches to address this challenge. But we argue that encrypting all intermediate data sets are neither efficient nor cost-

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effective because it is very time consuming and costly for data-intensive applications to en/decrypt data sets frequently while performing any operation on them. In this paper, we propose a novel upper bound privacy leakage constraint-based approach to identify which intermediate data sets need to be encrypted and which do not, so that privacy-preserving cost can be saved while the privacy requirements of data holders can still be satisfied.
Recent researches on Cloud Computing suggest that it is a new business model which can bring big benefits in sharing Information Resources to many companies and users. This paper analyzes some definitions of Cloud Computing and its features. To emphasize the future applications, the paper lists some instances about it. Consider the following problem in secure multiparty computation: Alice and Bob possess integers x and y respectively. Charlie is a researcher who would like to compute the value of some function f(x, y). The requirement is that Charlie should not gain any knowledge about x and y other than that which can be obtained from the function itself. Moreover, Alice and Bob do not trust each other and should not gain knowledge about each other's data. This paper contains initial work on a methodology to enable such secure function evaluation using additive and multiplicative homomorphism as cryptographic primitives instead of oblivious transfer. It is shown that Charlie can compute the encrypted value of any polynomial in x

by pooling and sharing resources. Systems and storage can be provisioned as needed from a centralized infrastructure, costs are assessed on a metered basis, multi-tenancy is enabled, and resources are scalable with agility.

1.2. Cloud Service

Cloud Computing is an effective information sharing technology due to its nature. Many cloud service providers are also available in real time. The cloud service providers are providing various services like 1. SAAS (Software as a service), 2. IAAS (Infrastructure as a Service), 3. PAAS (Platform as a Service). Due to the nature of resource sharing in cloud, the cloud service providers are providing these services on rental basis. So that CSPs' are able to develop their business. Cloud is the vast developing technology, and its major challenge is the cloud security. In particularly IAAS requires high level of security because of data leakage and hacking. So implementing data integrity for the data stored in the cloud servers takes place here. The system assures and y. We present two secure function evaluation protocols for semi-honest participants that can be extended to polynomial functions of an arbitrary number of variables.

Cloud computing is poised to revolutionize computing as a service. With the ability to provide on-demand computing resources dynamically, companies can fundamentally change their information technology strategy. As with any new technology, this new way of doing business brings with it new challenges, especially when considering the security and privacy of the information stored and processed within the cloud. Cloud computing utilizes massively scalable computing resources delivered as a service using Internet technologies. Cloud computing allows these computational resources to be shared among a vast number of consumers to allow for a lower cost of ownership of information technology. Cloud computing takes the technology, services, and applications that are similar to those on the Internet and turns them into a self-service utility. The use of the word "cloud" makes reference to the two essential concepts: **Abstraction**: Cloud computing abstracts the details of system implementation from users and developers. Applications run on physical systems that aren't specified, data is stored in locations that are unknown, administration of systems is outsourced to others, and access by users is ubiquitous. **Virtualization**: Cloud computing virtualizes systems data safety which is verified by the third party auditor (TPA).

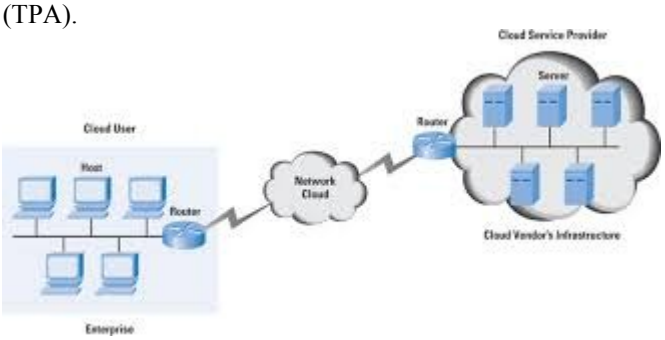

Fig. 1 Cloud Computing Scenario

Nowadays in cloud computing, only single owner verification is implemented. If the data owner's sensitive information's were hacked by the attacker then they can perform malicious activities in the cloud environment. So implementing multi owner authentication to grant the user permission to access the data is done. Data is spitted into smaller parts and hashed using Merkle Hash Algorithm. Top hash code

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which is generated and provided to TPA for the data integrity verification. Load balancing is again major threat for data download. Calculating CPU load through current work load and performance of the machine for effective data download.

1.3. The Basic Schemes

Since the job arrival pattern is not predictable and the capacities of each node in the cloud differ, for load balancing problem, workload control is crucial to improve system performance and maintain stability. Load balancing schemes depending on Whether the system dynamics are important can be either static or dynamic [6]. Static schemes do not use the system information and are less complex while dynamic schemes will bring additional costs for the system but can change as the system status changes. A dynamic scheme is used here for its flexibility. The model has a main controller and balancers to gather and analyze the information. Thus, the dynamic control has little influence on the other working nodes. The system status then provides a basis for choosing the right load balancing strategy. However, load balancing in the cloud is still a new problem that needs new architectures to adapt too many changes. Chaczko et al. [8] described the role that load balancing plays in improving the performance and maintaining stability. There are many load balancing algorithms, such as Round Robin, Equally Spread Current Execution Algorithm, and Ant Colony algorithm. Nishant et al. [9] used the ant colony optimization method in nodes load balancing. Randles et al. [10] gave a compared analysis of some algorithms in cloud computing by checking the performance time and cost. They concluded that the ESCE algorithm and throttled algorithm are better than the Round Robin algorithm. Some of the classical loads balancing methods are similar to the allocation method in the operating system, for example, the Round Robin algorithm and the First Come First Served (FCFS) rules. The Round Robin algorithm is used here because it is fairly simple.

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2. Literature Survey

Cloud computing is an attracting technology in the field of computer science. In Gartner's report[1], it says that the cloud will bring changes to the IT industry. The cloud is changing our life by providing users with new types of services. Users get service from a cloud without paying attention to the details[2]. NIST gave a definition of cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction[3]. More and more people pay attention to cloud computing[4, 5]. Cloud computing is efficient and scalable but maintaining the stability of processing some any jobs in the cloud computing environment is a very complex problem with load balancing receiving much attention for researchers. Since the job arrival pattern is not predictable and the capacities of each node in the cloud differ, for load balancing problem, workload control is crucial to improve system performance and maintain stability.

Load balancing schemes depending on whether the system dynamics are important can be either static and dynamic[6]. Static schemes do not use the system information and are less complex while dynamic schemes will bring additional costs for the system but can change as the system status changes. A dynamic scheme is used here for its flexibility. The model has a main controller and balancers to gather and analyze the information. Thus, the dynamic control has little influence on the other working nodes. The system status then provides a basis for choosing the right load balancing strategy. The load balancing model given in this article is aimed at the public cloud which has numerous nodes with distributed computing resources in many different geographic

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3. The Proposed Schemes

The load balancing model given in this article is aimed at the public cloud which has numerous nodes with distributed computing resources in many different geographic locations. Thus, this model divides the public cloud into several cloud partitions. When the environment is very large and complex, these divisions simplify the load balancing. The cloud has a main controller that chooses the suitable partitions for arriving jobs while the balancer for each cloud partition chooses the best load balancing strategy. There are several cloud computing categories with this work focused on a public cloud. A public cloud is based on the standard cloud computing model, with service provided by a service provider. A large public cloud will include many nodes and the nodes in Different geographical locations. Cloud partitioning is used to manage this large cloud. A cloud partition is a subarea of the public cloud with divisions based on the geographic locations. The load balancing strategy is based on the cloud partitioning concept. After creating the cloud partitions, the load balancing then starts: when a job arrives at the system, with the main controller deciding which cloud partition should receive the job. The partition load balancer then decides how to assign the jobs to the nodes. When the load status of a cloud partition is normal, this partitioning can be accomplished locally.

3.1. Modification

After analyzing the requirements of the task to be performed, the next step is to analyze the problem and understand its context. The first activity in the phase is studying the existing system and other is to understand the requirements and domain of the new system. Both the activities are equally important, but the first activity serves as a basis of giving the functional specifications and then successful design of the proposed system. Understanding the properties and requirements of a new system is more difficult and requires creative thinking and understanding of existing running system is also difficult, improper understanding of present system can lead diversion from solution.

Advantages: A public cloud is based on the standard cloud computing model, with service provided by a service provider. A large public cloud will include many nodes and the nodes in Different geographical locations. Cloud partitioning is used to manage this large cloud. A cloud partition is a subarea of the public cloud with divisions based on the geographic locations. The load balancing strategy is based on the cloud partitioning concept. After creating the cloud partitions, the load balancing then starts: when a job arrives at the system, with the main controller deciding which cloud partition should receive the job. The partition load balancer then decides how to assign the jobs to the nodes. When the load status of a cloud partition is normal, this partitioning can be accomplished locally.

3.2. System Implementation

The global utility function approach of Multi Attribute Utility Theory (MAUT) meets the preceding requirements, and allows us to balance the competing and simultaneous demands of expressiveness, elicitation, learning, and reasoning. The calendaring domain demands a model that can express potentially complex ordinal and cardinal preferences over a combinatorial domain (the schedule options). By providing a single (additive utility) function by which the system can rate alternative schedules, a MAUT approach is in principle amenable to the schedule evaluation and preference learning components. Based on our user study, augmented by features suggested in prior work in the literature we identified seven criteria consistent across different users:

Time: scheduling windows for the requested meetings

Duration: durations of meetings

Overlap: overlaps, ordering constraints, and conflicts between requested and existing meetings

Location: locations of meetings

Participants: participants in meetings

Stability: time or duration changes for existing meetings

Others: preferences of others participating in new meetings or rescheduled existing meetings. Thus our project will overcome all those points and will schedule the best timings for meeting.

Functional Features of the model

As far as the project is developed the functionality is simple, the objective of the proposal is to strengthen

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the functioning of Audit Status Monitoring and make them effective and better. The entire scope has been classified into five streams knows as Coordinator Level, management Level, Auditor Level, User Level and State Web Coordinator Level. The proposed software will cover the information needs with respect to each request of the user group viz. accepting the request, providing vulnerability document report and the current status of the audit.

Input and output

The major inputs and outputs and major functions of the system are follows:

Input:

Senior citizens applying some request and service.

Output:

These request is will take processed.

Process Model used with justification:

ACCESS CONTROL FOR DATA WHICH REQUIRE USER AUTHENTICATION

The following commands specify access control identifiers and they are typically used to authorize and authenticate the user (command codes are shown in parentheses)

USER NAME (USER)

The user identification is that which is required by the server for access to its file system. This command will normally be the first command transmitted by the user after the control connections are made (some servers may require this).

PASSWORD (PASS)

This command must be immediately preceded by the user name command, and, for some sites, completes the user's identification for access control. Since password information is quite sensitive, it is desirable in general to "mask" it or suppress type out.

Scope of the System: Good load balance will improve the performance of the entire cloud. However, there is no common method that can adapt to all possible different ituations. Various methods have been developed in improving existing solutions to resolve new problems. Each particular method has advantage in a particular area but not in all situations. Therefore, the current model integrates several methods and switches between the load balance methods based on the system status. A relatively simple method can be used for the partition idle state with a more complex method for the normal state. The load balancers then switch methods as the status changes. Here, the idle status uses an improved Round Robin algorithm while the normal status uses a game theory based load balancing strategy.

3.3 Architecture Diagram

Main Controller and Balancers: The load balance solution is done by the main controller and the balancers. The main controller first assigns jobs to the suitable cloud partition and then communicates with the balancers in each partition to refresh this status information. Since the main controller deals with information for each partition, smaller data sets will lead to the higher processing rates. The balancers in each partition gather the status information from every node and then choose the right strategy to distribute the jobs.

Assigning Jobs to the Cloud Partition: When a job arrives at the public cloud, the first step is to choose the right partition. The cloud partition status can be divided into three types:

(1) **Idle:** When the percentage of idle nodes exceeds _, change to idle status
(2) **Normal**: When the percentage of the normal nodes exceeds _, change to normal load status.
(3) **Overload**: When the percentage of the overloaded nodes exceeds, change to overloaded status. The parameters _, _, and are set by the cloud partition balancers. The main controller has to communicate with the balancers frequently to refresh the status information. The main controller then dispatches the jobs using the following strategy: When job i arrives at the system, the main controller queries the cloud partition where job is located. If this location's status is idle or normal, the job is handled locally. If not, another cloud partition is found that is not overloaded.

Motivation: Good load balance will improve the performance of the entire cloud. However, there is no common method that can adapt to all possible different situations. Various methods have been developed in improving existing solutions to resolve new problems. Each particular method has advantage in a particular area but not in all situations. Therefore,

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Load Balance Strategy for the Idle Status: When the cloud partition is idle, many computing resources are available and relatively few jobs are arriving. In this situation, this cloud partition has the ability to process jobs as quickly as possible so a simple load balancing method can be used. There are many simple load balance algorithm methods such as the Random algorithm, the Weight Round Robin, and the Dynamic Round Robin [12]. The Round Robin algorithm is used here for its simplicity. The Round Robin algorithm is one of the simplest load balancing algorithms, which passes each new request to the next server in the queue. The algorithm does not record the status of each connection so it has no status information. In the regular Round Robin algorithm, every node has an equal opportunity to be chosen. However, in a public cloud, the configuration and the performance of each node will be not the same; thus, this method may overload some nodes. Thus, an improved Round Robin algorithm is used, which called "Round Robin based on the load degree evaluation".

Load Balancing Strategy for the Normal Status: When the cloud partition is normal, jobs are arriving much faster than in the idle state and the situation is far more complex, so a different strategy is used for the load balancing. Each user wants his jobs completed in the shortest time, so the public cloud needs a method that can complete the jobs of all users with reasonable response time. Penmatsa and Chronopoulos [13] proposed a static load balancing strategy based on game theory for distributed systems. And this work provides us with a new review of the load balance problem in the cloud environment. As an implementation of distributed system, the load balancing in the cloud computing environment can be viewed as a game. Game theory has non-cooperative games and cooperative games. In cooperative games, the decision makers eventually come to an agreement which is called a binding agreement. Each decision maker decides by comparing notes with each other's. In non-cooperative games, each decision maker makes decisions only for his own benefit. The system then reaches the Nash equilibrium, where each decision maker makes the optimized decision. The Nash equilibrium is when each player in the game has chosen a strategy and no player can benefit by changing his or her strategy while the other players' strategies remain unchanged.

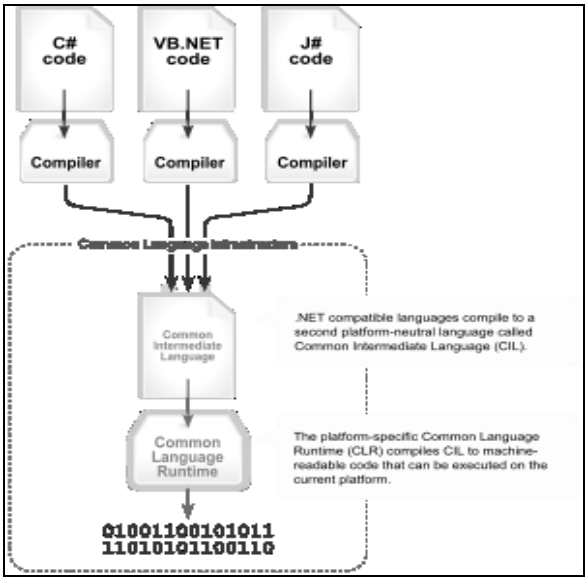

Fig. 2 Proposed System Architecture

4. Conclusion

Load balancing in the cloud computing environment has been an important impact on the performance. Good load balancing makes cloud computing more efficient and improves user satisfaction. This article introduced a better load balance model for the public cloud based on the cloud partitioning concept with a switch mechanism to choose different strategies for different situations. The algorithm applied the game theory to the load balancing strategy to improve the efficiency in the public cloud environment.

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