A

Project Report on

# FAST AND PARALLEL TRUST COMPUTING SCHEME BASED ON BIG DATA ANALYSIS FOR COLLABORATION CLOUD SERVICE (PHASE-I)

*Submitted for partial fulfilment of the requirements for the award of the degree of*

**BACHELOR OF TECHNOLOGY**

**in**

**COMPUTER SCIENCE AND ENGINEERING**

**by**


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**JANUARY - 2022**

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## CERTIFICATE

This is to certify that the project entitled **"FAST AND PARALLEL TRUST COMPUTING SCHEME BASED ON BIG DATA ANALYSIS FOR COLLABORATION CLOUD SERVICE"** is being submitted by **MEDIKONDA NAVEEN BABU 18K81A0593, NUCHU ABHIJEET PRAKASH YADAV 18K81A05A0, PASUPULETI KRISHNA TEJASVI 18K81A05A3, MANISH RAPOLE 18K81A05A7**, in fulfilment of the requirement for the award of degree of **BACHELOR IN COMPUTER SCIENCE AND ENGINEERING** is recorded of bonafide work carried out by them. The result embodied in this report have been verified and found satisfactory.

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

## DECLARATION

We, the students of '**Bachelor of Technology in Department of Computer Science and Engineering'**, session: 2018 - 2022**, St. Martin's Engineering College, Dhulapally, Kompally, Secunderabad,** hereby declare that the work presented in this Mini Project Work entitled **FAST AND PARALLEL TRUST COMPUTING SCHEME BASED ON BIG DATA ANALYSIS FOR COLLABORATION CLOUD SERVICE** the outcome of our own bonafide work and is correct to the best of our knowledge and this work has been undertaken taking care of Engineering Ethics. This result embodied in this project report has not been submitted in any university for award of any degree.

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# ACKNOWLEDGEMENT

The satisfaction and euphoria that accompanies the successful completion of any task would be incomplete without the mention of the people who made it possible and whose encouragement and guidance have crowded our efforts with success.

We extend our deep sense of gratitude to Principal, **Dr. P. SANTOSH KUMAR PATRA**, St. Martin's Engineering College Dhulapally, for permitting us to undertake this project

We are also thankful to **Dr. M. NARAYANAN** Head of the Department, Computer Science and Engineering, St. Martin's Engineering College, Dhulapally, Secunderabad. for his support and guidance throughout our project as well as Project Coordinator **Dr. K. SRINIVAS**, Associate Professor, Computer Science and Engineering department for his valuable support.

We would like to express our sincere gratitude and indebtedness to our project supervisor **Dr. K. SRINIVAS,** Assistant Professor, Department of Computer Science and Engineering, St. Martins Engineering College, Dhulapally, for his support and guidance throughout our project.

Finally, we express thanks to all those who have helped us successfully completing this project. Furthermore, we would like to thank our family and friends for their moral support and encouragement. We express thanks to all those who have helped us in successfully completing the project.

# ABSTRACT

Providing high trustworthy service is the most fundamental task for any cloud computing platform. Users are willing to deliver their computing tasks and the most sensitive data to cloud data centers, which is based on the trust relationship established between users and cloud service providers. However, with the development of collaboration cloud computing, how to provider fast response for a large number of users' service requests becomes a challenging problem. In order to quickly provide highly trustworthy services, the service platform must efficiently and quickly reply tens of millions of service requests, and automatically match-make tens of thousands of service resources.

In this context, lightweight and fast (high-speed, lowoverhead) trust computing schemes become the fundamental demand for implementing a trustworthy and collaborative cloud service. In this paper, we propose an innovative and parallel trust computing scheme based on big data analysis for the trustworthy cloud service environment. First, a distributed and modular perceiving architecture for large-scale virtual machines' service behavior is proposed relying on distributed monitoring agents. Then, an adaptive, lightweight, and parallel trust computing scheme is proposed for big monitored data. To the best of our knowledge, this paper is the first to use a blocked and parallel computing mechanism, the speed of trust calculation is greatly accelerated, which makes this trust computing scheme very suitable for a large-scale cloud computing environment. Performance analysis and experimental results verify feasibility and effectiveness of the proposed scheme.

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# LIST OF ACRONYMS AND DEFINITIONS

| S No. | ACRONYM | DEFINITION |
|---|---|---|
| 01 | SLA | Service Level Agreement |
| 02 | VM | Virtual Machine |
| 03 | QoS | Quality of Service |
| 04 | TSP | Trust Service Provider |
| 05 | CSP | Cloud Service Provider |
| 06 | CP | Cloud Provider |
| 07 | CSU | Cloud Service User |
| 08 | SOTS | Systems of Trauma Scale |
| 09 | XMPP | Extensible Messaging and Presence Protocol |
| 10 | SLR | Systematic Literature Review |
| 11 | STCB | Selected Cloud Service Broker |
| 12 | API | Application Programming Interface |

# 1. INTRODUCTION

The recent growing in cloud computing benefits from its ability to provide software, infrastructure, and platform services without requiring large investment to manage and operate them. Clouds typically involve service providers, infrastructure/resource providers, and service users. They include applications delivered as services, as well as the hardware and software systems providing these services. Recently, collaborative cloud computing has gradually attracted the attention of industry and academia. Liking the Internet is the inevitable stage of development of network technologies, the collaborative cloud computing will be an inevitable trend of cloud computing development. The collabo1rative cloud computing successfully uses information technology as a service over the network and provides end-users with extremely strong computational capability and huge memory space at low cost. Apart from the cost, the collaborative cloud computing also supports the growing concerns of carbon emissions and environmental impact since the collaborative cloud computing advocates better management of resources. Although, all benefits introduced by collaborative cloud computing, this new paradigm still faces several challenges related to trust computing, responding speed, and automatic resource match-making. All these challenges will introduce new holistic design, cooperative strategies and distribution infrastructures.

The trust computing approach to distributed system security was developed as an answer to the inadequacy of traditional authorization mechanisms. Currently, trust computing mechanism is considered to be the survival cornerstone of cloud computing applications. This can effectively promote service resources to provide a stable service according to Service-Level Agreement (SLA) between users and providers. Researchers generally believe that trust computing mechanism is considered to be the survival cornerstone of cloud computing applications. Different from traditional authentication mechanism in network security, trust mechanism can provide dynamic service behavior perceiving capability. Thus, trust mechanism can take precautionary measures against malicious service behavior from authenticated service providers in service providing. From many scholars understanding, to increase the adoption of the collaboration cloud services, cloud providers must first establish trust to alleviate the worries of a large number of users.

A lack of trust between cloud users and providers has hindered the universal acceptance of clouds as outsourced computing services. However, compared with traditional networks, the collaborative cloud computing environment has many

specific features such as resources belonging to different organizations or individuals, and such resources being completely distributed, heterogeneous, and totally virtualized; these features indicate that unmodified traditional trust management mechanisms can no longer be used in multiple cloud collaboration computing environments. Currently, trust computing mechanism faces key challenging issues in large-scale collaboration cloud computing environment. First, trust is beyond security and an expanded trust model should incorporate multi-dimensional trust factors. Thus, the new expanded trust computing model will contain data that can be imported from existing attributes (that is, security, reliability, availability, etc.) to form a multidimensional trust model. This highlights the fact that the level of trust should be evaluated by the large-scale dynamic service behavior from VMs.

Thus, how to accurately calculate trustworthiness from larger-scale security and QoS related behavior data is the first challenging issue. On the other hand, in a large-scale cloud application environment, there are tens of thousands of service resources, tens of millions of users and hundreds of millions of service monitoring data. Thus, how to quickly perceive cloud service behavior in such a cloud environment with huge network entity is another challenging issue. In order to quickly provide highly trustworthy services, the service platform must efficiently and quickly reply tens of millions of service requests, and automatically match-make tens of thousands of service resources. In this context, light weight and fast trust computing schemes become the fundamental demand for implementing trustworthy and collaborative cloud service.

# 2. LITERATURE SURVEY

Cloud computing provides many opportunities for enterprises by offering a range of computing services. In today's competitive environment, the service dynamism, elasticity, and choices offered by this highly scalable technology are too attractive for enterprises to ignore. These opportunities, however, don't come without challenges. Cloud computing has opened up a new frontier of challenges by introducing a different type of trust scenario. Today, the problem of trusting cloud computing is a paramount concern for most enterprises. It's not that the enterprises don't trust the cloud providers' intentions; rather, they question cloud computing's capabilities. Yet the challenges of trusting cloud computing don't lie entirely in the technology itself. The dearth of customer confidence also stems from lack of transparency, a loss of control over data assets, and unclear security assurances [1].

Through analyzing the built-in relationship between the users, the broker, and the service resources, this paper proposes a middleware framework of trust management that can effectively reduce user burden and improve system dependability. Based on multi-dimensional resource service operators, we model the problem of trust evaluation as a process of multi-attribute decision-making, and develop an adaptive trust evaluation approach based on information entropy theory. As a result, using SOTS, the broker can efficiently and accurately prepare the most trusted resources in advance, and thus provide more dependable resources to users. Our experiments yield interesting and meaningful observations that can facilitate the effective utilization of SOTS in a large-scale multi-cloud environment [2].

We address the problem of trust management in multi-cloud environments using a trust management architecture based on a group of distributed Trust Service Providers (TSPs). These are independent third-party providers, trusted by Cloud Providers (CPs), Cloud Service Providers (CSPs) and Cloud Service Users (CSUs), that provide trust related services to cloud participants. Furthermore, we introduce a trust propagation network among TSPs across different clouds, which is used by a TSP to obtain trust information about a service from other Tsps. The proposed trust management framework for a multi-cloud environment is based on the proposed trust evaluation model and the trust propagation network. Experiments show that our proposed framework is effective in differentiating trustworthy and untrustworthy CSPs in a multi-cloud environment [3].

Trust and security have prevented businesses from fully accepting cloud platforms. To protect clouds, providers must first secure virtualized datacenter resources, uphold user privacy, and preserve data integrity. The authors suggest using a trust-overlay network over multiple data centers to implement a reputation system for establishing trust between service providers and data owners. Data coloring and software watermarking techniques protect shared data objects and massively distributed software modules. These techniques safeguard multi-way authentications, enable single sign-on in the cloud, and tighten access control for sensitive data in both public and private clouds. Advantage of the direct method over the other is that it does not involve key update phase for all non-revoked users interacting with the key authority [4].

Cloud computing is a new paradigm in which dynamically scalable virtualized computing resources are provided as a service over the Internet. However, since resources are limited, it is very important that cloud providers efficiently provide their resources. This paper presents a trust model for efficient reconfiguration and allocation of computing resources satisfying various user requests. Our model collects and analyzes reliability based on historical information of servers in a Cloud data center. Then it prepares the best available resources for each service request in advance, providing the best resources to users. We also carried out experiments for reliability analysis with 4 data types, including an all-data set, random data set, recent data set, and the data set within a standard deviation [5].

An important challenge is assessing the trustworthiness to enable the users for choosing the trustworthy resources in the cloud infrastructure. However, in the cloud environments, despite the significance of the trust mechanisms and methods, the comprehensive and systematic research and study about the background of the trust evaluation methods between the cloud providers is rare. Hence, in this paper, we analyzed the trust evaluation state of the art mechanisms which are used in the cloud environment so far. Also, we analyzed and compared them in terms of integrity, security, reliability, dependability, safety, dynamicity, confidentiality, scalability, and giving a suggestion for some future research. Also, this article displays a systematic literature review (SLR) on the trust evaluation mechanisms in the cloud environments up to the end of March 2017 [6].

T-broker, a trust-aware service brokering scheme for efficient matching cloud services (or resources) to satisfy various user requests. T-broker acts as the middleware for cloud trust management and service matching. First, the trusted third

party-based service brokering architecture is the proposed for multiple cloud and environment. T- broker uses the lightweight feedback mechanism, which can effectively reduce networking risk and the improve system efficiency. Then, T-broker uses the hybrid, adaptive trust model to compute the overall trust degree of service resources. [7].

Trust plays an important role in all commercial grid and cloud environments. It is the estimation of competence of a resource provider in completing a task based on reliability, security, capability and availability in the context of distributed environment. It enables users to select the best resources in the heterogeneous grid and cloud infrastructure. The resource broker chooses appropriate grid/cloud resource in heterogeneous environment based on the requirements of user. The proposed trust enhanced resource broker evaluates the trust value of the resources based on the identity as well as behavioral trust. The proposed model considers metrics suitable for both grid and cloud resources. The results of the experiments show that the proposed model selects the dependable and reliable resources in grid and cloud environment [8].

A proposed proxy-based multi-cloud computing framework allows dynamic, on-the-fly collaborations and resource sharing among cloud-based services, addressing trust, policy, and privacy issues without preestablished collaboration agreements or standardized interfaces [9].

The issues of virtual machine management and cooperation formation in such an environment. First, for the cooperative organizations, an optimization model is formulated and solved for the optimal virtual machine allocation so that the total cost is minimized. Then, the cost management based on cooperative game theory is applied to obtain the fair share of the cost. Second, the cooperation formation among organizations is analyzed using the network game. With the dynamic cooperation formation, the stable cooperation structure is obtained. Both cooperative virtual machine management and cooperation formation are intertwined, in which the proposed optimization and game models can be used to obtain the solution of the rational organizations to minimize their own costs [10].

This paper introduces XMPP and suggests how this technology might be used to help implement Intercloud communication. It gives an introduction to XMPP and how the architecture fits together as well as a discussion of the services it provides `out of the box'. It then discusses secondary benefits of the protocol and highlights how XMPP could be an appropriate base protocol for implementing the Intercloud Control and Management Plane [11].

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The ultimate goal of cloud providers by providing resources is increasing their revenues. This goal leads to a selfish behavior that negatively affects the users of a commercial multiload environment. We theoretically analyse the truthfulness and the efficiency of the mechanism and present extensive experimental results showing significant impact of the selfish behavior of the cloud providers on the efficiency of the whole system. The experiments conducted using real-world and synthetic workflow applications demonstrate that our solutions dominate in most cases the Pareto-optimal solutions estimated by two classical multi-objective evolutionary algorithms [13].

The ultimate goal of cloud providers by providing resources is increasing their revenues. This goal leads to a selfish behavior that negatively affects the users of a commercial multi cloud environment. In this paper, we introduce a pricing model and a truthful mechanism for scheduling single tasks considering two objectives: monetary cost and completion time. With respect to the social cost of the mechanism, i.e., minimizing the completion time and monetary cost, we extend the mechanism for dynamic scheduling of scientific workflows. We theoretically analyze the truthfulness and the efficiency of the mechanism and present extensive experimental results showing significant impact of the selfish behavior of the cloud providers on the efficiency of the whole system. The experiments conducted using real-world and synthetic workflow applications demonstrate that our solutions dominate in most cases the Pareto-optimal solutions estimated by two classical multi objective evolutionary algorithms [14].

T-broker a trust-aware service brokering scheme for efficient matching cloud services (or resources) to satisfy various user requests. First a trusted third party-based service brokering architecture is proposed for multiple cloud environment, in which the T-broker acts as a middleware for cloud trust management and service matching [15].

# 3. SOFTWARE/HARDWARE DESIGN

## 3.1 EXISTING SYSTEM

Currently, trust computing mechanism faces key challenging issues in large-scale collaboration cloud computing environment. First, trust is beyond security and an expanded trust model should incorporate multi-dimensional trust factors. Thus, the new expanded trust computing model will contain data that can be imported from existing attributes (that is, security, reliability, availability, etc.) to form a multidimensional trust mode. This highlights the fact that the level of trust should be evaluated by the large-scale dynamic service behavior from VMs. Thus, how to accurately calculate trustworthiness from larger-scale security and QoS related behavior data is the first challenging issue. On the other hand, in a large-scale cloud application environment, there are tens of thousands of service resources, tens of millions of users and hundreds of millions of service monitoring data. Thus, how to quickly perceive cloud service behavior in such a cloud environment with huge network entity is another challenging issue. In order to quickly provide highly trustworthy services, the service platform must efficiently and quickly reply tens of millions of service requests, and automatically match-make tens of thousands of service resources. In this context, lightweight and fast (high-speed, low-overhead) trust computing schemes become the fundamental demand for implementing trustworthy and collaborative cloud service.

**Disadvantages of Existing System:**

1. We are unable to find the accurate trust
2. With the development of collaboration cloud computing, how to provider fast response for a large number of users' service requests becomes a challenging problem.

## 3.2 PROPOSED SYSTEM

In this project, we proposed an innovative and lightweight trust computing scheme based on big data analysis for trustworthy cloud service environment. By a plurality of original design, the proposed scheme can efficiently perceive service behavior of large-scale VMs, and quickly complete the trustworthiness computing of service resources based on these large-scale and real-time perceiving data.

**Advantages of Proposed System:**

1. Users can obtain the service through a selected cloud broker (STCSB). Providing fast, trustworthy, and secure service in the main task of the STCSB
2. At the same time, due to the use of a blocked and parallel computing mechanism, the speed of trust calculation is greatly accelerated, which makes this trust computing scheme is very suitable for largescale cloud computing environment.

## 3.3 REQUIREMENTS

**Hardware Requirements:**

| | | |
|---|---|---|
| Processor | - | intel i3 |
| Ram | - | 8 GB |
| Hard Disk | - | 20 GB |

**Software Requirements:**

| | | |
|---|---|---|
| Operating System | - | Windows 10 |
| Coding Language | - | Java |

# 4 IMPLEMENTATION

## 4.1 MODULES

**Communication and Agent Management**

Communication and agent management module, which has two basic functions: cloud service connection and adaptation, and agent publish and agent-based data perceiving. The cloud service connection and adaptation sub-module is used to collect and index all resource information from multiple providers. This sub-module encapsulates different application programming interfaces (APIs) provided by different cloud service providers or cloud sites, such that other modules of the trustworthy service monitoring architecture only need to be aware of a single set of APIs. The agent publishes and data perceiving sub-module monitors the real-time service data of allocated resources to guarantee Service Level Agreement (SLA) with users. In the interactive process, through agents distributed in remote cloud sites, this sub-module dynamically monitors the VM's service behavior and is responsible for perceiving run-time service behavior data, including security related behavior data and QoS-related behavior data. The monitored data are stored in an evidence base, which is maintained by the monitoring system.

**Cloud resource management**

Through the federated service catalog, this module stores all available and trustworthy services from which it can automatically select highly trustworthy services to meet user's requirements. This module creates a service catalog that links with a highly trusted resource and then provides this catalog as a trusted resource for the user through the unified cloud service portal.

**Trust computing**

This module is not only the core of the trustworthy cloud computing system, but is also a key focus of this paper. Using this module, the trust computing system can dynamically sort high-performance service resources by analyzing real-time service behavior monitored by the distributed agents. At the same time, this sub-module provides the function of unified access portal both for users and administrator. Cloud users open a unified cloud service portal and select a trusted service catalog when they would like to use providers. An administrator manages virtual servers on the unified cloud management portal. The unified cloud service portal creates virtual server templates, which are enrolled in advance as service catalogs into the cloud management platform.

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