Brief Study to Explore Trust and Security Challenges in Cloud Computing

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Abstract. Cloud Computing is an online strategy for dynamic allocation of services by reducing the usage of hardware and software resources. Existing models of cloud computing include different components: end-user computers, contact networks, access control frameworks, and software infrastructures. The data and the cloud infrastructure must be protected from any known and unknown attacks on all cloud platforms to achieve comprehensive cloud security. Trust issues arise from uncertainty about certain actions that can be defined through the concept of fuzzy belief. Trust is faith in quality provided by the cloud service provider and third-party agent on consumers and vice-versa where quality can be considered in terms of functionality, security, privacy, data safety, and reliability on cloud resources. Although the members of a social network have a strong level of trust, this trust may not be adequate in certain cases and becomes an obstacle in the successful implementation of cloud services. For example, a storage facility where users are vulnerable to missing, infected, or corrupted data, while providers are at risk of unknown data being hosted from their network. The relationship between two business partners decays more rapidly relative to the trust of users in the social network of the cloud. This paper aims to address the trust issues in existing cloud paradigms and highlights the existing flaws which will be resolved in the future course of action.

Keywords: Cloud Computing, Cloud Challenges, Trust Issues, Trust Management, Social Cloud.

1. Introduction

Trust management is the most important factor while considering the cloud. Here are some questions which need to be discussed:

- Why trust issues are considered in cloud computing?
- How trust issues raised and what exactly these trust issues are?

Many considerations, such as ownership, regulation, accountability, etc., are identified in current studies that must be taken into account in trust estimates. The difficulty with any of the previous
studies is that the principles of alternate choices are often interlinked with reciprocity and confidence, and experimental findings cannot be easily be determined that one dimension is relevant.

The applications of cloud computing are infinite. Every device can work on a cloud computing platform i.e. from generic software to personalized computer programs. As shown in Figure 1, many physical objects like storage, servers, database, mobile, and applications are connected via the cloud. Some of the applications of cloud computing are as follows:

![Figure 1. Applications of Cloud Computing](image)

1.1. Academic Institutions: Digitally equipped devices use fast-growing technology as a service via the internet. These services provide educational software to students, teachers, and communication devices, which can be beneficial for them. These are all based on a Web Services Model that can communicate via Android mobile apps with Android and Java customers. These Cloud-based apps provide a better alternative to schools at low cost [2].

1.2. Intrusion Detection System: Cloud computing does not offer customers a simple and secure network environment for powerful computing resources, it also deals with security problems in terms of preventing security threats and data leakage. The treatment of malicious attacks is one of the major security concerns. A shared intrusion sensing framework is suggested to counter these attacks and this system is designed with the E-CARGO platform. The components of the intrusion detection framework are specified in conjunction with CIDF(Common Intrusion Detection Frame) [3].

1.3. Financial performance: Compared to legacy solutions, businesses do not have to build their expensive platforms and instead can adopt the cutting-edge services of cloud computing. There have been studies performed to determine the financial performance of cloud computing firms. The study findings that the cost structure of cloud computing firms and the return on sales have improved significantly [4].

1.4. Green cloud computing: In the 2013 Science Conclave, the Nobel laureate of Geography "Professor Walter J Kohan" at the Indian Institute of Information Technology Allahabad, said, "the biggest challenge for the Young Generation is Crisis of Energy and Environmental Issues." The goal should be to minimize CO2 emissions by creating Green Cloud Computing companies which will play a significant role in reducing the carbon footprint [5].
1.5. Healthcare: Cloud computing adoption is increasing in all sectors including health care, providing a new and improved way to address challenges in the field. For example, The cloud computing model proposes to share information between physicians in different countries on critical diseases and cases to improve treatment [6].

2. Literature Review

Proper trust management can help their rapid adoption in cloud environments. Confidence can counteract the many security threats facing the cloud. This literature review offers an overview of how to trust in cloud computing has been introduced.

| Year of Publication | Author’s Name | Summary |
|---------------------|---------------|---------|
| 2020 | Al-Jaser, N. M. A. | Data privacy has always been important. An individual entity may contain the personal data of millions of customers—data that requires to maintain the privacy and safeguard the customers’ identities safe and secured as possible, and support the organization to save the company's reputation. [16]. |
| 2020 | Devi, R. K., & Thangadura, K. | The author depicts the security problems in the area of cloud computing is complete and different categories based on this technique providing trust in a collaborative platform. [17]. |
| 2020 | Punit Gupta, Pradeep Kumar Gupta | Trust models are used to verify nodes' stability over the distributed network in any kind of distributed system, from (MANETS), sensor networks, and grid computing. [18]. |
| 2020 | Tabrizchi, H., & Rafsanjani, M. K. | A comprehensive overview of the security issues clouds organizations such as the cloud operator, data owners, and cloud customers have been studied and explained. [19]. |
| 2020 | Kaushik, S., & Gandhi, C. | Through a trustworthy third party and a quorum of key administrators, the security problems are overcome. [20]. |
| 2020 | Ali, M. B., Wood-Harper, T., & Ramlogan, R. | The authors proposed a strategic vision of five stages to address trust difficulties affecting the adoption of UK university cloud services. They conclude that the effectiveness of the strategic system is dependent on IT and management engagement and support. [21] |
| 2020 | Liu, A., Liu, G., Orgun, M.A. et al. | The human and collaboration features of crowdsourcing allow one to examine the trust, privacy, and protection concerns in this emerging environment because people in the crowd are usually inexperienced. [22]. |
| 2019 | Mahreen Saleem Khan, M.R Warsi, Saiful Islam | The author discussed the challenges of Cloud ecosystem trust management and highlight some of the significant challenges faced by cloud computing environments towards addressing the problem of trust management [23]. |
| Year of Publication | Author’s                          | Summary                                                                                                                                 |
|---------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 2019                | Yefeng Ruan, Arjan Durresi        | There are two sections of this paper: trustworthiness and confidence. Trust Management System. The confidence management system will provide managers and cloud clients with feedback on decision-making. [24]. |
| 2017                | Qichao Xu, Zhou Su, Shui Yu, Ying Wang | This paper has provided an opportunity to delegate big data tasks with a mobile cloud-based on the social trust level [25].  |
| 2017                | X. Chen and L. Wang               | The author has proposed a mechanism that enables a vehicular social network in a trust management scheme [26].                           |
| 2013                | Francisco Moyano, Carmen Fernandez-Gago, Javier Lopez | The author addressed the criteria of confidence and reputation by integrating the principles of trust relationships and reputation into these scenarios. [27]. |
| 2012                | Simon Caton, Christoph Dukat, et.al. | The author spoke of trust in the social cloud as a central element and confidence and sharing for online communities. confidence can not be completely understood in the sense of social network-based collaboration [28]. |
| 2010                | Kyle Chard, Simon Caton, et.al.   | Researchers combined trust relationships with appropriate incentives that could offer much more sustainable mechanisms for the sharing of resources. [29]. |

3. Challenges in Cloud Computing
In the past decade, the use of cloud computing by companies has become a major concern. Cloud computing guarantees that enterprises can easily obtain and control their IT requirements with effective cost[7].
Figure 2. Challenges in Cloud Computing [8].

For deployment models like public, private, hybrid, and community: common safety issues are to be dealt with authentication, authorization, access control, and security of data. The Public cloud is less secure than the others. Thus, Malicious hackers are more likely to be targeted to collect information for private hacking. Service security is the responsibility of providers and any unauthorized access or malicious attack of the service must be prevented. Data privacy and information privacy are the responsibility of users, for example, transparency, privacy, authority, and authentication.

4. Mostly Used Keywords
There are the top 10 keywords used in total 743 papers, cloud computing is the most used keywords as shown in Table I.

Table 1. Word Map of Keywords.
5. Identified Tools and Technologies
There are some tools and technologies that existed in cloud computing:

5.1. CloudSim: CloudSim is a simulation tool, which allows cloud developers in a cost-free, predictable environment to test the efficiency of their supply policies. Until real-world implementation, it helps to balance the bottlenecks. CloudSim is a program to read and feed trace files for checking the power model, load balance, or scheduling model as an input to the simulation environment. By using CloudSim, developers will concentrate on particular application architecture problems that they choose to explore, without thinking about the specifics of cloud-based applications and services.

5.2. CloudAnalyst: CloudAnalyst is one of the most popular research tools for studying cloud performance in several inputs and environmental settings thanks to its graphic representation, ease of use, and ease in nature.

5.3. GreenCloud: It is the first open-source computing platform to operate on virtual packets, where packets are sent to the data center from user to cloud controller (broker). GreenCloud is used to solve the issue of resource allocation algorithm output control, task optimization, and load-balancing algorithms.

5.4. iCanCloud: This method models the entire network simulation and concurrently simulates a request-based application simulation model. The primary purpose of this program is to predict and closely analyze the system's performance in all possible implementations such as costs, operations, network loads, memory processor output, and all device usage.

5.5. EMUSIM: The software application behavior is simulated using an automatic emulation system and cloud behavior through CloudSim.

6. Present State of Art regarding identified problems

6.1. Al-Jaser, N. M. A. (2020) depicts that data privacy has always been important. An individual entity may contain the personal data of millions of customers - data that requires to maintain the privacy and safeguard the customers' identities safe and secured as possible, and support the organization to save the company's reputation [16].

6.2. Mahreen Saleem Khan, et.al.(2019) proposed the challenges of trust management in cloud computing ecosystems and highlighted some of the issues that once addressed would play a central role in cultivating trust in cloud ecosystems. the primary concerns include privacy, security, and trust which are the major barriers to the adoption of cloud by individuals and organizations as a whole. Cloud computing trust has three main comparisons, namely faith in the cloud provider, trust in CSP cloud infrastructure, and faith in Cloud technology itself. [23].

6.3. Yefeng Ruan & Arjan Durresi(2019) A new trustability (trust-reliability) calculating how often a program can be trusted under a specific attack vector has been implemented. Redundancy is an important method to make the cloud computing environment more survivable. This is no longer true for the old security paradigm consisting of protecting the network perimeter. We will presume that any methods of protection we use in applications will be broken sooner or later [24].

6.4. Qichao Xu, Zhou Su, Shui Yu, Ying Wang (2017) Due to the uncertain danger and damages incurred by many economic crises, the problems of trust and risk management for big data and cloud storage platforms are of primary importance [25].
6.5. X. Chen and L. Wang (2017) The focus in VSNs, which are special types of social networks, together with the vehicular network, is on addressing the question of trust. Furthermore, confidence is not the issue of traditional safety because complex and uncertain behaviors in humans are commonly involved in them which are intimately connected with human psychology. To order to enhance their applicability, it is also important to consider these human psychological variables [26].

6.6. Francisco Moyano, Carmen Fernandez-Gago, Javier Lopez (2013) stated that by integrating into the scenarios, the notions of trust relationships and reputation, trust, and credibility criteria will create security. [28].

Computer and information technology work focuses on the scientific understanding of trust in an electronic device but lacks the analytical scope to appreciate trust. Instead, trust models are designed to help decision-making.

There are many security challenges faced by cloud units such as cloud service providers, data owners, and cloud owners. Many researchers are coming up with multiple solutions to trust issues.

Creating a Data Storage Platform to find potential business channels for developing a dynamic social network cloud infrastructure. Trust as a foundation for the resource (information, hardware, services) sharing in a Social Cloud. Facebook users can find out how their friends provide commercial storage services by benefiting from the established relationships of trust. Link to appropriate reward mechanisms (via financial payments or trade) may provide much more sustainable mechanisms for sharing resources. [24].

Identification of malicious users for accessing the cloud is a difficult task. To gain trust in cloud users becomes a crucial activity for cloud owners and cloud service providers. Some cloud services have overcome the issue of limited resources and lowered costs by sharing available resources with many users, where trust issues arise while sharing multiple resources by multiple users[16]. To reach a target solution about trust issues, various factors need to be focused while sharing resources like integrity, confidentiality, and authentication.

Various Trust management techniques are to be applied on cloud platforms for gaining trust like Service Level Agreement, Recommendation based Trust management technique, Reputation-based Trust management technique, Prediction based Trust management technique, and Policy-based Trust management technique. These techniques attempted to solve challenges of Trust Management in Cloud computing that misuse cloud computing, Unstable Application Programming interfaces, Harmful users, shared technology vulnerabilities, data loss unknown third users. There is still an urgent requirement to focus on removing trust barriers to take full advantage of cloud computing[30]. Trust Model may be implemented in the future to handle data on social cloud especially in collaboration activities and trust can be measured in the context of social networking.

7. Conclusion
This has been concluded that several studies are underway to address trust management in a cloud environment. Trust models proposed for cloud computing systems are introduced in contemporary literature. Besides, a critical comparison is included, based on the principal features of a suitable trust management method. But still, there is a requirement to overcome various open issues to provide stable cloud infrastructure. We discussed different tools and resources for cloud storage settings and found that the protection of the resources depends on resource sensitivity. Different activities rely on trust while migration of suspicious node tasks to trustworthy nodes, dynamic resource allocation, and commercial management between redundancy and resource costs.
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