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MULTI SOURCE FEEDBACK AND FOG COMPUTING IN SOCIAL SENSOR USING TRUST COMPUTING MECHANISM

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***Abstract*— Due to the agility and the variety of cloud computing, it has drawn significant attention from enterprises and academic researchers. Cloud computing is no longer a buzzword, it's a strategy, a business model, and a set of technologies. Cloud computing addresses both technical and organizational aspects, ranging from resource provisioning to systems interoperability, from the level of IT-related outsourcing of an enterprise to the capability of effortless keeping the pace of hardware and software innovation. Social Sensor Cloud (SSC) is combined with social network, wireless sensor network, cloud computing, currently a new type of Internet of Things. In order to provide a convenient, and highly reliable social sensor cloud services, the devices of computing are distributed at the edge of cloud computing. The devices of computing can independently process and store data, feedback more quickly in SSC. The sensing layer of SSC faces different types of physical attacks and communication attacks, such as message forgery, message tampering, reply attacks, hidden data attacks, etc., leads to the lack of trust between social sensors and cloud data centers in SSC. Theoretical analyses and simulation results show that the proposed trust computing mechanism has better computational efficiency and higher reliability compared with existing methods. The involvement of cloud computing will change not only the way of business models but also the way of people's life.**

Index Terms— **social sensor cloud, Cloud computing,**

I. Introduction

During the last decade, IS researchers have progressively placed cloud computing at the core of management literature. From the perspective of management, this thesis aims to increase our understanding on the adoption and the decision-making of cloud computing. Ang Li has identified common services of cloud computing: elastic computing cluster, persistent storage, intra-cloud network and wide-area network. Cluster runs application's codes using numerous virtual instances. Persistent storage is used to keep data of application and accessed through API calls. Intra-cloud network provides connection between application instances, wide-area network connects different data centers where the applications are hosted.

Early studies on cloud computing adoption tend to be skewed toward benefits and challenges, yet in spite of some segmentation efforts, actually there is a lack of research framework focusing on the adoption of cloud services and cloud deployment models. The strategies of cloud computing is very different from traditional IT strategies. There is a need to discuss how to select cloud services and cloud deployment models. Cloud computing is a transformative technology changing the way of IT information system, however, the transformative and value-creating capacity of cloud computing has attracted less attention, we need further research to contribute to the themes.

This section contributes to give a comprehensive analysis of cloud computing related notions and its development process. It starts with the introduction of related background notion for understanding the reminder of this dissertation. It continues with the description of the process of cloud computing development. Finally, it outlines the main definitions of cloud computing and its components.

II. Our System

However, SSC has similarity as the social evolution of online social networks. With social factors, SSC is different from traditional wireless sensor network. In the process of collecting social data, there are several difficulties and trust problems as follows:

The social sensor data is in large amount, and its structure type is complex [14], social sensors have limited storage capacity and heterogeneity devices are difficult to be compatible.

Based on the open social cloud environment, there are a large number of social sensors that may refuse to forward messages [16] or propagate a large number of false messages [17], wasting network transmission resources.

Social sensors have random mobility, their perceived data is prone to failure and cannot assess data authenticity.

Resulting in unnecessary computational overhead and unreliable social sensor cloud services.Malicious service providers provide untrustworthy services

For example, a large number of social users posted and disseminated false messages on social media sites during a major news event. First, false messages have a negative influence in the respect of social communication, second, the limited energy of the node is wasted and the service provided is unreliable from the perspective of SSC. In mobile ad-hoc networks, untrusted nodes may adversely affect the quality and reliability of sensor data, thereby harm the security of the service

A. Final Stage

new trust algorithm that aggregates different types of feedback is proposed by aggregating feedback trust values of different devices, since it is necessary to establish a trust computing mechanism with high reliability social sensor cloud by setting new trust metrics based on feedback from different nodes and servers, we propose a trust computing algorithm that aggregates different types of feedback trust values from different devices, the target node, and the in-termediate node, and matrices are established to perform multi-dimensional aggregation on the trust value, and weights according to different types of feedback values to aggregate the trust value of the social sensor node, then the trust value of the social sensor node is evaluated. The accuracy of data transmission by measuring security and quality of service of social sensor cloud services. The main contributions of this paper are as follows:

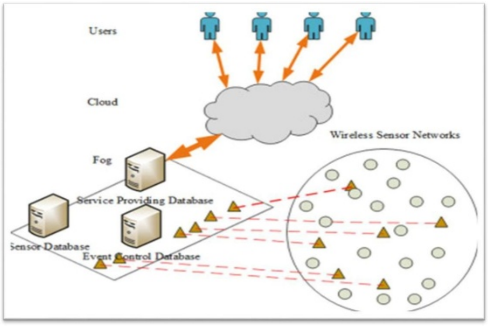
A fog-based social sensor cloud high-reliability trust computing architecture is established, enabling social sensor data to be effectively layered and processed in three stages of collection, transmission and calculation, which improves

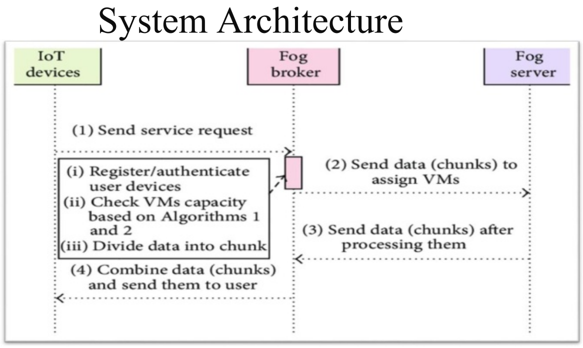
A lightweight trust computing mechanism combined with multi-source feedback and fog computing is designed. The trust computing is completed by the sensing layer and the fog layer. Social sensors of the sensing layer is monitored by fog device of the fog computing in real time, which meets the requirements of low latency. fog device undertakes part of task of trust computing and storage in the cloud data center, reduces the computational overhead and transmission cost of the cloud computing.

A new trust algorithm that aggregates different types of feedback is proposed. By weighting the trust values of different types of feedback, weight distribution is performed according to different trust factors, which overcomes the limitation of weight assignment of traditional trust schemes.

The organization of this paper is as follows. Section I in-troduces the trust computing scheme existing in SSC, Section II gives an overview of related work about trust mechanisms. Section III describes the social sensor cloud architecture with trust mechanism, and Section IV gives the trust analysis the fog computing of social sensor cloud architecture. Based on trust analysis of fog computing, Section V gives a detailed description of RTCM based on multi-source feedback and fog computing. Section VI analyzes the theory and the reliability of RTCM. Section VII summarizes this paper and proposes the direction of future research.

B. Figures





III. MATH

. S-to-S direct trust

The S-to-S direct trust computing is obtained from the records of past interactions of different social sensors directly, and does not need to be requested from a sensor. Each interaction between social sensors generates S-to-S direct trust. In wireless sensor networks, different types of evidence can be collected, such as packet success rate, routing success rate (interactive frequency), forwarding delay, data correctness rate, etc. Considering the social factors of social sensors, the social sensor proposes that the object of the service request service has its own personality preference. Here, we use the service quality rating as a factor of trust calculation, and the personality preference between social sensors and different objects as weight.

Before the service provider s_j receives the service request, its own service quality evaluation factor is:

$$; \quad {}^{self}_{s_j} \quad \overset{M}{X} = Q\,({}_j;\, t) = !_m \quad {}^{;t}_{attr} \tag{1}$$

m

After an interaction, according to the service attribute, the quality of service factor obtained by the social sensor s_i (s_i 2 S) that issues the service request to the service provider s_j (s_j2 S) is:

$$Q_{s;s_j} = Q\,(s_i\; t) = \sum_{m=1}^{M} !_m q^{;s_j} \tag{2}$$

The difference between the service provider s_j's own qual-ity of service rating factor and the quality of service rating factor obtained by the social sensor s_i that issued the service request is:

$$D_{Q(si;sj)} = \frac{Q^{t}_{s_j} \quad {}_{f;t} \quad Q^{sel}}{Q(s_j)} \qquad (3)$$

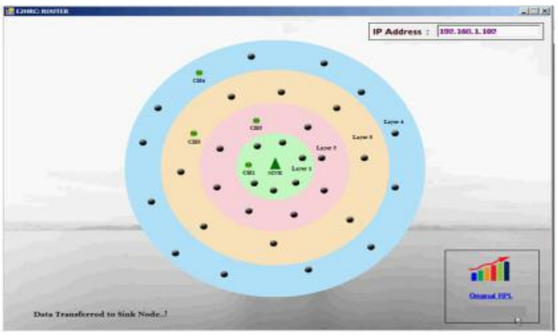
PARAMETERS AND POSSIBLE VALUES

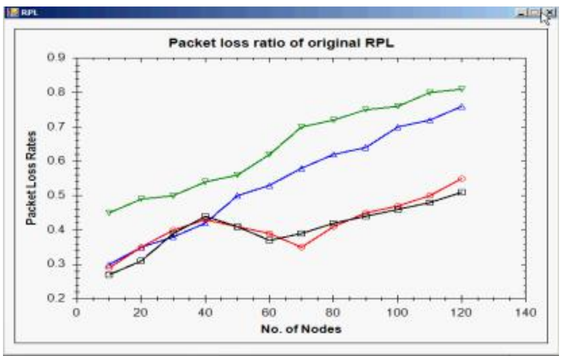
Name	Description	Value
S	Total number of social sensor nodes	1000
D	Total number of fog devices	40
t	Total simulation time	600s
(t)	Trust calculation interval	50s
HS	Honest social sensor node ratio	90%, 80%, 60%
FD	Proportion of collaborative fog equipment	25%, 50%, 75%
SG	Trust value of the social sensor node	0-1

IV. CONCLUSION

This paper proposes a reliable trust computing mechanism that combines multi-source feedback and fog computing in social sensor cloud. Firstly, trust value of social node is evaluated. Secondly, social sensor needs to compute the global trust value through the feedback of other nodes and fog devices. At the same time, an algorithm for dynamically adjusting the weights of different trust factors is proposed, which can optimize the social sensor cloud system with fog device, effectively improve the computing efficiency, reduce the communication delay and transmission cost, and enhance the service quality and security of the social sensor cloud. The simulation results show that compared with the existing trust mechanisms, RCTM has obvious advantages in terms of computational efficiency and reliability. However, there are still many fields for improvement in current trust computing system based on fog computing. The next step of the research work is to consider how to adjust the weights of different trust factors more flexibly according to the feedback of social sensor nodes, to increase the reliability of trust computing mechanism.

APPENDIX





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