A Trust Framework for Ranking User as a Cloud Provider in Peer-to-Peer cloud system

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ABSTRACT

Cloud computing is essential now for IT companies and for the users of IT companies . Recently researchers were focusing in peer-peer cloud computing, which also named as user as a cloud provider system. There are a few of researches discussed and implemented trust problem in peer-to-peer models. This paper presents a framework for automatically generate trust ranking for user as a cloud provider. The ranking is generated first by testing method for ranking QoS parameters, the second phase is applied trust factors to generate ranking for user as cloud provider. The generated ranking method is useful for cloud users to get benefit of their wasting resources, and other users will be trusted in renting cloud services while paying less cost.

Keywords

Cloud computing, Cloud services, Ranking QoS, Measurement.

1. INTRODUCTION

Cloud computing became an essential for IT infrastructure industry in the last decade. It saves the cost of building IT infrastructure for all types of companies small , medium and large IT companies. Cloud computing is 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 be rapidly provisioned and released with minimal management effort or service provider interaction. [10]Cloud computing composed of three main types of service Software as a service(SaaS), Platform as a Service (PaaS) and infrastructure as a service (IaaS). The biggest cloud computing service providers companies are Google which provides PaaS and SaaS, Amazon which provides IaaS, and Microsoft azure which provides PaaS and IaaS. There are four type of privacy in cloud computing architecture public cloud, private cloud, community cloud and hybrid cloud. This paradigm still has issues such as security, safety, and internet access problem. cloud computing building based on other technologies, such as: internet and virtual machine, due to that it inherited their problems. It is essential for cloud user to trust a cloud service provider performance, this decided by the functional and non-functional attributes in cloud computing non-functional attributes named as Quality of Service(QoS) parameters, such as: response time, execute time, security, safety, accuracy, accessibility,maintainability, agility,etc. There are a lot approaches for ranking quality of service such as Saurabh Kumar Garg et.al [5] proposed a SMIcloud ranking framework and Zibin Zheng et.al [13] presented a component framework to ranking QoS for cloud application. Other models for ranking QoS are [12]and [8]. To produce an efficient ranking methodology you must adapt good service level agreement to define the terms of QoS guarantee that the cloud user and cloud provider will agree at. SLA is a contract between a cloud provider and the cloud user that defines the expected level of service that cloud provider should deliver, the user of computing technologies, such as: personal computer, laptop, tablet, smart phone they wast a lot of resources such as CPU, RAM, Disk storage, and bandwidth. The cloud architecture give the opportunity to these users to rent their devices in architecture named as peer-to-peer cloud computing architecture. The problem under consideration in this paper is how to support trust in peer-to-peer cloud computing architecture. Providing a rank to user wants to be a cloud provider which name is user as a cloud provider we propose trust in such system. Recently there are researchers proposed a peer-to peer system, such as: Xiao Liu et. [**?**] proposed a cloud framework peer-to-peer named as SwinDeW-C, Bin Yu et.al [11] propose trust in large peer-to-peer system , [3] and [7] . These proposed model was helpful to a degree to provide a peer-to-peer ranking system. But there is no model or a specific framework for ranking peer-to-peer cloud computing system. In this paper we proposed a framework for automatically generate ranking system for peer-to-peer cloud system. So the final output of our framework is a user as a cloud provider ranking. That contains a rank for each QoS, rank for resource fairness algorithm, payment method rank, and rank for price

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plan for each user as a cloud provider. In this paper, we explain in details the idea of our framework. for the rest of paper, related work is presented in section 2. Peer-to-peer ranking framework described in section 3. A conclusion and framework are described in section 5.Acknowledgements and section 6 references.

2. RELATED WORK

There are many studies about Peer-to-Peer cloud computing but there few of them focus on trust problem in their approach. In this section we discuss current researches about Peer-to-Peer cloud computing system. Saurabh Kumar Gargg et al. [5] proposed a ranking framework for cloud computing services. This framework is build based on the ability to meet cloud user requirement of quality of service. The author also provide a mechanism to measure the quality of service parameters. One of the main reasons of this framework is by provided a health competition between cloud service providers. The evaluating phase of this framework is throwing a case study. Jiuyun Xu et al. [10] proposed a management approach for local reputation in cloud computing.The authors consider using the reputation by calculating the feedback of cloud customer is the most widespread technique for ranking cloud computing system. Arezoo Jahani et al. [6] presented an approach for ranking cloud computing based on QoS parameters. the author define the ranking problem in cloud computing system by the variety of cloud providers of service and the variety of services each provider deliver. This approach select the most suitable services based on analysis QoS features, they also evaluated this approach by applying a real workload dataset to their model. Zibin Zheng et al. [13] proposed a cloud ranking framework that driven from quality of service parameters value. This framework rank the cloud by take an advantage from past experience. The experimental study show that this approach better than competing approaches. Le-Hung Vu et al. [8] presented ranking and selecting cloud computing model based on QoS and reputation management. In this paper the author proposed a selecting and ranking model to solve application trust problem in cloud computing system. The authors also proposed a level of formality description of their approach. Ozalp Babaoglu et al. [3] proposed a peer to peer cloud computing approach they focus in implementing such a system but they don't focus in implementing a trust and secure system. This paper discusses that security and trust issues are a massive problem to peer-to-peer cloud computing, this problem occurs during to the large number of users as a cloud provider you have to trust and you did not sure that each one of them is responsible when they use the system . In our paper we proposed a trustful approach by ranking user as a cloud provider and the security is one of QoS Parameter that we included and ranked in our proposed framework.

Rajiv Ranjan [7] presented an approach of peer-to-peer cloud system based on cloud provisioning and load balancing mechanism. This paper considers two types of cloud computing in this approach private cloud and public cloud are discussed that peer-to-peer public cloud has many user as a cloud provider this lead to complicate the security issues and discuss it is very hard to guarantee a QoS parameters in such system they also provide response time measurement so this Qos parameter can be guarantee. They constrain on implementation their peer-to-peer approach by focusing on technical issues. In our approaches we proposed a framework , the proposed approach above can merge it with their model to solve QoS parameters guarantee problems.

Bin Yu et.al [11] proposes trust in large peer-to-peer system, which depends on two main attributes local ranking and aggregation ranking. local ranking is a direct ranking from user for user as provider, the ranking applies by give him zero or one. The aggregation ranking is an indirect ranking from group of users that tries the user as a provider taken by a user who did not try him. In each scenario the user decided to get a cloud service from him or not. There is a third scenario when the user as a provider get noisy it is means get a lot of reports the system will remove him from the system. In this approach system takes the QoS in general to rank the user as a provider. In our approach we consider each QoS parameter and ranked it for user as a provider. Also this approach is not specific for cloud computing, but our approach is. What distinguishes this approach is having a formal model to support trust issues in peer-to-peer system.

Mohammed Alhamad [2] presented a trusted model based on service level agreement of cloud computing. The first user will be unranked in this model the ranking approach started from the second round of experience from the cloud provider and cloud user. The proposed model started with analyzing the SLA-monitoring based in cloud user request. This approach contains of five step advertise cloud service, discovery of cloud provider, obtain a trusted list of cloud provider, give this list for SLA-agent, finally the cloud user will decided based on the result of SLA-monitoring. This model does not take into consideration of two important issues the first is the peer-to-peer cloud computing problem, the second is analyze SLA-violation and SLA-penalty. The proposed approach was little fuzzy about how to implement such trust model.and the good service level agreement must be composed of three steps SLA-negotiation, SLA-monitoring and SLA-violation and this approach does not.

Luis Diego Briceno et.al [4] presented resource allocation peer-to-peer with traditional cloud system, they divided the architecture of there model to main-server and secondary server and ordinary user. The most important job to secondary user is to prevent main server to over loaded or failed. The authors in this paper proposed a genetic algorithm to rid-off from the bad secondary server from the cloud system. This approach build for online games so the algorithm was proposed to add fairness for the player.This paper considers the cloud computing system infrastructure as a service. Our proposed approach based analyzing on SLA-violation and SLA-penalty for peer-to peer cloud computing system. In this approach model based in the advantage for the company that has the main server does not take user as a cloud provider in their consideration when they implementing their approach. This approach is different from our domain on specific side of peer-to-peer approach which is online gaming in the other hand our approach build for peer-to peer in general.

3. PROPOSED RANKING MODEL

In cloud computing, insuring the quality of service guarantee of using cloud services consider as an important trust methodology. Specially for peer-to-peer cloud computing techniques. There are different approaches for measuring QoS parameters such as QoS ranking system in [5] and based

on SLA monitoring system proposed in [1]. Abdel-Rahman AL-Ghuwairi at.al [1] proposed an enforcement and monitoring SLA model. we use this model to compute SLA-violation and SLA-penalty for user as a cloud provider services.

3.1 SLA MODEL

In this section we described the SLA model propoesed by [1] in details.

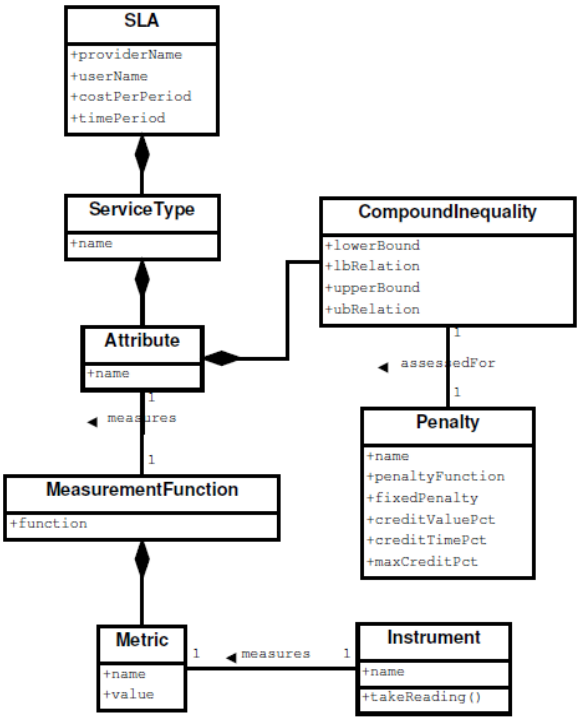

Figure 1: The SLA model

As shown in the figure 1,

- Services level agreement (SLA) : it is a component define SLA- attribute which are provider name, user name, cost per period and time period.
- Services type : the cloud user will choose type of service from infrastructure as a service types such as VM, Storage and processors.
- QoS attribute: the cloud user will choose type of QoS parameters from one of these QoS parameter security, safety, availability, response time, execution time, and bandwidth.
- Measurement function: it is a component composed of metric or set of metrics for each QoS parameters.
- Metric: it is a component compose of metric name and the value, this component used to provide instrument component with correct metric.
- Compound inequality: it is an attribute compare the QoS parameter measurement with the term condition for each QoS parameter in SLA.
- Penalty: finally the last component will be produced penalty credit for the SLA-violation in period of time these components contain a user name, penalty function, fixed penalty, credit value, credit time and max credit price.

3.2 Raking model

In general view, the proposed approach extract QoS parameter ranking for each user gets an acceptance, mainly the SLA-violations will analyze for each user get a cloud service from the user as a cloud provider. Figure 2 shows our propose framework.In actors of proposed framework was discuss.

- User: there are two type of user in our framework, the first type is whom want to become user as a cloud provider, the second type is person who want to get a cloud service.
- Initial ranking: is a component that test user as a cloud provider for QoS parameters measurement , and responsible of accepting user as a cloud provider.
- User as a cloud provider : a person whom was accepted by initial ranking system.
- Service Level agreement- monitoring: it monitor SLA term such as QoS parameter Guarantee. This component responsible for measuring QoS overtime. and generate SLA-violation and SLA-penalty.
- Resource fairness algorithm: is a component that responsible for achieve fairness in resource scheduling algorithm.
- Payment method: a component responsible of choosing the method of paying the cost of service the most popular one is eBay[], Sponas[], Histos[], and Western Union[] .
- Price plan: it is responsible for choosing the price methods for services from one of the following fixed recurring pricing, variable pricing by resource consumption, variable pricing by time and multipliers.
- Analyzer: it is a component that is responsible for ranking the trust factor fro the UaaCP and update the rank of UaaCP after serve each user.
- New QoS rank for UaaCP: it is a component that contain new ranking of the QoS parameter for UaaCP.
- Terminate UaaCP: the UaaCP has many reports from ordinary user will be terminated, the UaaCP reach rank zero will be terminated.

The main contribution of our paper is provided an approach for ranking peer-to-peer cloud system based on ranking multi trust factor which are SLA-monitoring, resource fairness algorithm, payment method, and price plan. Yao Wang et al. [9] proposed six steps guidelines to build an approach or a model for trust and reputation for web based system. In this paper we cover the first five of the, ad the last one we will cover it in the future.

The first guideline is send a queries, in our model the cloud user send a resource requirement request for peer-to-peer system. Resource requirement request will contain the

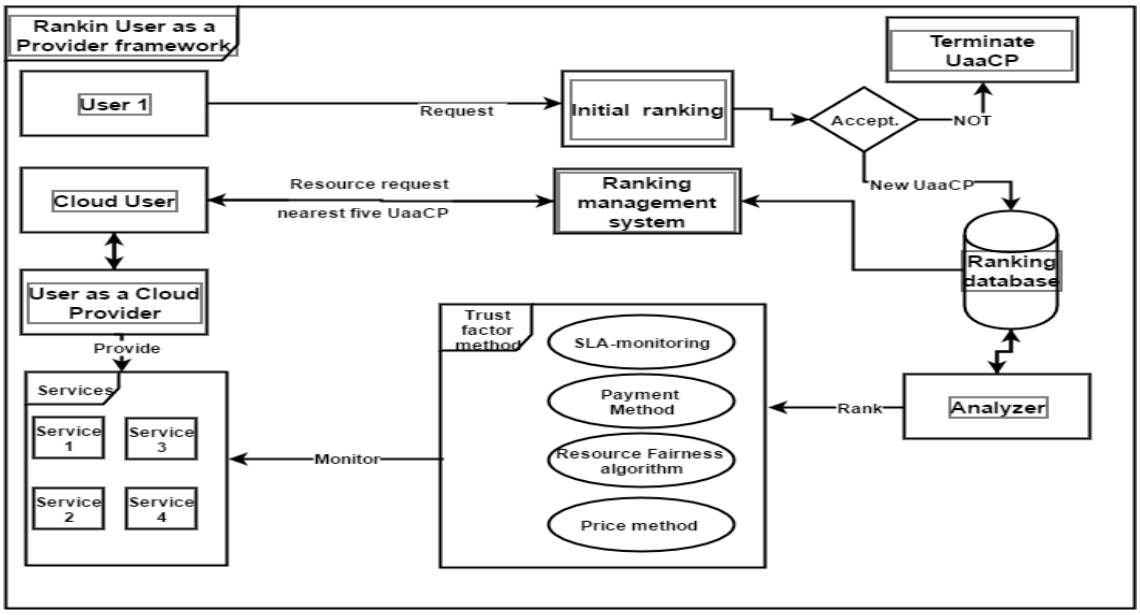

Figure 2: The proposed rank framework

amount of resource, payment method, price plan and resource fairness algorithm. The second guideline is ask for recommendation, in this paper the cloud user get a recommendation of the nearest five UaaCP to his resource requirement request. The third guideline is select a provider, in our model the cloud user will select one of the proposed UaaCP in the last step. The fourth guideline is interaction, the analyzer in our model will evaluated the service deliver from UaaCP, based on third party monitoring system. The rank will be derived from the substitution of equations 1,2,3,4,5,6. The fifth guideline is update trust , in our model the analyzer will update the ranking of the UaaCP after serving each cloud user. The sixth guideline is update neighbours, in this step the selecting approach will be based on past trust from cloud user to a specific UaaCP, we will add an update neighbours feature based on social network, which the cloud user can chose a UaaCP or user as a recommender, but this step is before the user send resource requirement request. .

A. Initial Ranking

Peer-to-peer, is a model where trust is the most important issue. We try to propose such a ranking framework to solve this problem in addition to the problem discussed above the first phase of our approach is initial ranking system. In this phase we discuss how to produce a raking list for UaaCP for the first time, first the user who want to become a cloud provider send a request for cloud ranking management, this user will be tested for QoS parameters guarantee in the second step , in third step the cloud ranking system will send the acceptance based on the last step, and if the user was accepted then the cloud ranking management will send the acceptance for user and add him/her for UaaCP ranking list.

B. Proposed Peer-to-Peer Ranking model

1. Service Level Agreement Monitoring Phase

A SLA-violation and SLA-penalty credit will generated for each user as a cloud provider here the ranking well be based on SLA-violation and penalty. In this paper we calculate the rank of this factor by substitution equation 1 as the following.

$$RSLAu_i = RSLAu_i + \sum_{j=1}^{j=n} RQoS_j \tag{1}$$

Where RSLAui is ranking for service level agreement for the UaaCP i,RQoSj is the ranking for quality of service j for the UaaCP i.

$$RQoS_j = 0.1 - min\left(NV * 0.025, 1\right) \tag{2}$$

Where RQoSj is the ranking for quality of service j for the UaaCP i, and NV is the number of violation for quality of service j.

2. Resource Fairness Algorithm

Recently many researchers start to proposed a resource allocation approaches providing some level of fairness. Ali Ghodsi et al.[] proposed a dominant resource fairness for multiple resource types. In this paper we calculate the rank of this factor by substitution equation 3 as the following.

$$\left\{\begin{matrix} RFu_i = RFu_i + 0.05 & ,if ARFu_i = true \\ RFu_i = RFu_i - 0.1 & ,if ARFu_i = false \end{matrix}\right\} \tag{3}$$

Where RFui is the ranking for resource fairness factor for UaaCP i, and ARFui is the value of applying the fairness algorithm.

3. Payment Method

An important factor of trust in a system such as cloud computing peer-to-peer system is by providing a trusted payment method. In this paper we calculate the rank of this factor by substitution equation 4 as the following.

$$\left\{\begin{matrix} RPayu_i = RPayu_i + 0.05 & ,if ARPayu_i = true \\ RPayu_i = RPayu_i - 3 & ,if ARPayu_i = false \end{matrix}\right\} \tag{4}$$

where RPPui is the ranking for payment method factor for UaaCP i, ARPPui is the value for applying payment method.

4. Price Plan

Price plan is very important factor of trust in peer-to-peer system such critical factor need special ranking method. In this paper we calculate the rank of this factor by substitution equation 5 as the following.

$$\begin{Bmatrix} RPPu_i = RPPu_i + 0.05 & ,if ARPPu_i = true \\ RPPu_i = RPPu_i - .05 & ,if ARPPu_i = false \end{Bmatrix} \quad (5)$$

where RPayui is the ranking for price plan factor for UaaCP i, ARPayui is the value for applying price plan. If the price plan was not applied for twice time the peer-to-peer system will terminate the UaaCP i. and if the cloud user was the cause of the problem the peer-to-peer system will terminate him from the first time. If the UaaCP rank was 0 for any trust factor ranking value the system will terminate him. Finally the rank for UaaCP will be generated by substituting equation 6 .

$$Ru_i = RSLAu_i + RFu_i + RPayu_i + RPPu_i \quad (6)$$

Where Rui is the ranking for UaaCP i. new User of this system can get a trusted service in peer-to-peer cloud computing which is a very complex system.

4. CONCLUSIONS AND FUTURE WORK

In this paper we proposed an approach to automatically generate ranking services for peer-to-peer cloud computing system. The approach automatically measuring QoS parameters value, SLA-violation, SLA-monitoring and SLA-penalty. Then analyze these information from the SLA-database and used them to generate UaaCP ranking list. This list contained from the information about each UaaCP, the rank value for each QoS parameter and general rank for UaaCP. The ranking approach is focusing on the SLA monitoring value such SLA-violation and SLA-penalty. The presented approach helped in building trust between cloud user and peer-to-peer cloud computing architecture. Which has many problems in trust issues such as you cannot trust many users to deliver to you a good service. This approach can be helpful to user to gets a trustful service while paying less money. It also helped user to decrease the wasting resource such as CPU, RAM, Disk storage and bandwidth. The proposed approach can help the medium institute such university to reduce the cost of running IT infrastructure by renting the available devices as a peer-to-peer cloud services. We are currently working on adding a price model based on the ranking approach, When the UaaCP increasing his/her rank ,the price he get will automatically increase.It is a positive relation between cost and quality. In the future work also we will added an evaluating process will apply to compare our approach with current approach by a quantitative approach. A defect prediction approach for analyzing SLA will increase the efficiency of the rank system. We start an investigation about a formal model for ranking peer-to peer cloud computing system based on analyzed SLA.

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