Ontological Services level Agreement (SLA) Model and Its Application in Cloud Computing Environment

RUSLI ABDULLAH
Department of Information System
Faculty of Computer Science and Information Technology
University Putra Malaysia
e-mail: rusli@fsktm.upm.edu.my

Abstract: Service Level Agreement (SLA) is a contractual agreement that has been established between the members of community of practice (CoP) that consists of the service provider and the recipient for a specific application of services based on its allocating and sharing resources as a services in cloud computing. This agreement is an outcome that based on negotiation process will be identifying and describing the SLA that has been offered by the service provider or ownership of the cloud to their respective recipients. The resource allocation engagement or what we called as RaaS are including the software (Software as a Service - SaaS), infrastructure (Infrastructure as a Service – IaaS), and platform (Platform as a Service – PaaS). In this context, there are many parties who are very concerning about it, but unfortunately there is lacking of a common of SLA of best practice as a guideline that can be used for CoP to make use for the future purposes in engaging with services in the cloud environment. Therefore, in this paper will discuss the model of SLA in order to ensure everybody who are providing and receiving the services in the cloud satisfied and getting the best maximum return of the investment in allocating and sharing resources among the providers and recipients in cloud computing environment.

Key-Words: Service Level Agreement, Resource Allocation, Software as a Service, Infrastructure as a Service, and Platform as a Service, Cloud Computing.

1 Introduction

Ontology is the key enabling power in realizing the full potential of service in cloud computing environment. It has played an important roles in supporting the common tasks of resources cloud service or what we called as resource as a service (RaaS) which is being categories into several level components of services such as Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS). In the context of cloud computing, ontological of services level agreement (SLA) has also played an important features to enable sharing of resources of services between cloud service provider (CSP) and cloud service requester (CSR) in utilizing the RaaS as well as a part of promoting a knowledge sharing especially for those who are willing to work together in a collaborative environment [1] for the benefits of their community of practice (CoP).

This application or utilization of SLA together with RaaS will be working based on their service of agreement as a contract which is involed both parties that to be decided towards benefitials impact of their business organization of the future[9]. Therefore, there is a need of a model that focuses on ontological SLA which is related to RaaS that to become as a standard guidance to those who are involved in cloud computing enviroment. Furthermore, by describing all those features of categories of SLA or we called as ontological of SLA, it will be covering of all aspects of services especially related to RaaS of the organization requirement, which is providing the efficient and effective of services or also called as quality of services (QoS) for CoP in a particular environment.

2 Literature Review

In Cloud Computing (CC) doesn't matter whether it is public or private cloud, it was promoting and offering a lot of services that provided for the CoP with taking care by themselves in term of licensing, agreements, and many other things in managing hardware and software. These services are including Platform as a Service (PaaS), Infrastructure as Service (IaaS), Storage as a Service (DaaS), and Software as a Service (SaaS) [2,3,4,5,7]. Service Level Agreement (SLA) is a contractual agreement that has been established between the members of the community of practice (CoP) that consists of the

service provider and the recipient for a specific application of services based on its allocating and sharing resources as a service (RaaS) in cloud computing environment.

A common SLA as what been described by wiki (2011) [8] is a part of a service contract where the level of service is formally defined. In practice, the term *SLA* is sometimes used to refer to the contracted delivery time (of the service) or performance. As an example, internet service providers will commonly include service level agreements within the terms of their contracts with customers to define the level(s) of service being sold in plain language terms. In this case the SLA will typically have a technical definition in terms of *mean time between failures* (MTBF), *mean time to repair* or *mean time to recovery* (MTTR); various data rates; throughput; jitter; or similar measurable details.

In this practice, the SLA has also played an important role in cloud computing environment especially related to the indication and determination of the agreement level between the service provider and the recipients. In this context, the services will be implementing also based on resource as a service (RaaS) from the services provider to the potential recipients.

The relationship of the Services Agreement and Resource utilization in cloud computing environment between the supplier and demander is shown in Table 1.

Table 1: The relationship between the Service and Resources in SLA

Agreement	**Type of Resources**
Level of Service Requirement	Software such as application development and deployment of the business purposes
	Infrastructure such as computer virtualization, computer networking and data center
	Platform such as operating system for running the computer based on software and infrastructure requirement

3 Research Methodology

In order to formulate and propose the model of ontological of SLA and its application in cloud computing environment, there are few steps that has been taken and conducted based on a series of sequences as shown in Fig 1.

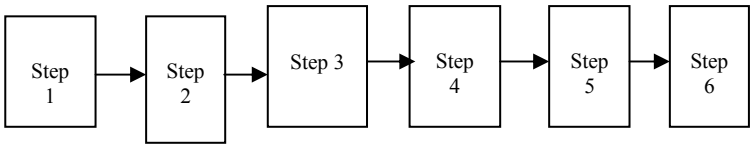

Fig 1: Steps in Ontological SLA model formulation

The methodology of the research is started by performing the analysis of literature (Step1) regarding on the service level agreement (SLA) its related to resources as a service (RaaS) in cloud computing, and then followed by conducting a preliminary survey (Step2) through the expert opinion interviewed that based on those who are really involved in dealing with the cloud computing environment such as cloud administrator, cloud software engineer, cloud programmers and actives of cloud end users.

At this stage, a preliminary analysis has been done in formulating the SLA model (Step3) as a propose model which closed related to resource as a service (RaaS) (Step4). After that, the simple measurement of the RaaS of SLA model and it application is also analyzed (Step5) in determining the best criteria of service level in cloud computing environment (Step6).

4 Result and Discussion

As result of our study and as what been discussed in our research methodology, the proposed ontological of SLA model based on RaaS, can be divided into three elements which is involving the CSP and CSR as shown in Fig 2. The discussion is also

highlighting based on first level of services only in maintaining the services agreement among them.

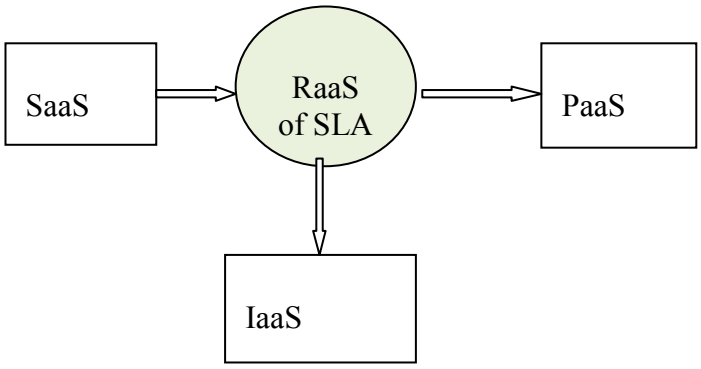

Fig 2: SLA Model and Its Application with RaaS

Besides that, the ontological SLA model in RaaS is also can be described in the cloud computing environment that is highlighting based on its utilization of resource such as Software, Infrastructure, and Platform. The detail of its utilization of RaaS explanations is shown in the Table 2, Table 3 and Table 4 respectively.

- RaaS for SaaS - Table 2 is showing the attributes as ontological SLA model and it level concern between CSP and CSR that may considered for resources agreement in software as a service in cloud computing environment. The possible level of services could be started with period of time, Availability, Accessibility and Authentication.
- RaaS for IaaS – Table 3 is showing the attributes which is carrying the same weightage of its requirement as ontological of SLA that may considered between CSP and CSR for resources in managing the infrastructure agreement as services in cloud computing environment. The possible level of services could be started with Highly, Moderate and Low.
- RaaS for PaaS - Table 4 is showing the attributes that may considered for resources in platform agreement as services in cloud computing environment. A variety of software frameworks are usually made available to PaaS developers, depending on application focus. Cloud service Providers that focus on Web and enterprise application hosting offer popular frameworks such as Ruby on Rails, Spring, Java EE, and .NET. The possible level of services could be started with Highly, Moderate and Low.

Table 2: The relation of SLA and its Software Utilization

SLA Model of attributes for SaaS	**RaaS Level**
Warranty, licensing	Validation period
Compatibility, Availability guarantees	Time Taken
Maintainability, Performance,	High Availability
Security	Authentication
Support	Accessibility

Table 3: The relation of SLA and its Infrastructure Utilization

SLA Model of attributes for IaaS	**Raas Level**
Connectivity	Highly
Openness	Highly
Suitability	Moderate
Readiness	Highly
Maintainability	Moderate
Portability	Moderate

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Table 4: The relation of SLA and its Platform Utilization

SLA Model of attributes for PaaS	RaaS Level
Standardization	Highly
Configuration	Moderate
Readability	Highly
Reliability	Highly
Extensibility	Moderate

5 Conclusion and future Work

As a conclusion, the ontological of SLA Model that has been offered by the cloud service provider or ownership of the cloud to their respective recipients need to be done in mutual agreement, so that it can be getting the benefits for all people especially in allocating and engaging the resources or what we called as RaaS, that are including the software (Software as a Service - SaaS), infrastructure (Infrastructure as a Service – IaaS), and platform (Platform as a Service – PaaS). In this context, there are many parties who are very concerning about it, can make use of this proposed model as a common of SLA Model of best practice as well as a guidelines, so that the CoP can use it in order to ensuring the quality of services (QoS) for the future purposes in engaging with high capability of services in the cloud computing environment.

Therefore, the model of RaaS of SLA is also can be considered for future research work in order to ensure everybody who are dealing and receiving the services in the cloud will getting highest satisfaction and getting the best maximum return of the investment (ROI) in allocating and sharing their resources among the cloud providers and recipients in cloud computing environment.

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