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Novel Approach for Developing Effective Service Level Agreements for Cloud Computing

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Abstract: In current technological era, business organizations are deploying services on cloud and for impartial business objectives a concrete set of service level agreements are to be put into practice. This paper provides a novel methodology to develop effective service level agreements and we evolve towards a robust framework while mitigating inherent difficulties faced by involved stakeholders. An efficient penalty management system approach is also advocated .This approach assumes few considerations and in future this assumptions will play a vital role in construction of a adaptive service level agreement so that no conflicts of interest occur while performing business transactions. The approach presented in this paper is generic and can be applied to any business domain.

Keywords: Service, Performance, Penalty, Monitoring, Reporting

I. INTRODUCTION

In socio benefits of services must be determined by exact economic system the definitions as to conditions of their usage. This conditions are dictated in the service level Agreements(SLA) of the business organisations. The IT/business stack can be efficiently managed by a effective SLA management framework. Since 2005 the vision of cloud computing approach to deliver services in multiple business sectors has leveraged the profits of the organisations to a appreciable reason. But at the same time it also has highlighted the challenges inherent in services provisioning. The need of SLA emerged from this challenges .In future Internet or Internet of Things ,business transactions cannot occur without the theme of service level agreement. From customer point of view ,no formally agreed SLA's are in place to indicate quality of the goods .From the vendor point of view this can happen at the cost of time, effort. To add to the existing difficulty, transparency does not exist in this case. To manage the exact conditions of SLA's to individual customers is impossible for any company so a holistic management framework is also the need for conducting business . Expected benefits of SLA's are more dynamic ,dependable ,transparent, flexible services.

II. VISION

We propose a framework where SLA can be negotiated with a degree of freedom for both the negotiating parties. It will result into a better business environment. Currently most of the frameworks have rigid SLA and it is automated by the business parties based on specific conditions. The difficultly in existing frameworks for SLA management is that user level SLA's cannot be directly mapped to the physical infrastructures. SLA's are mapped between top level of business layers with customers. Low business layers are unaware of the exact SLA's. Violation of SLA's result into compensations to users .In our framework for SLA management we propose a SLA indicator value at each business layer so that while operations are done at each layer, the degree of SLA's can be adjusted so as to meet the SLA value at the top of the business layer level. It is like a concept of self optimization process. In addition to that we propose a self detection of low SLA's value and re-plan the conditions to get a healthy value for SLA's.

The algorithm operates in following steps:

1.Start

2.For each business layer i do repeat following steps

i. Determine degree of SLA

ii. if degree of SLA<=MAX Degree(SLA) and degree of SLA>MIN Degree(SLA) THEN

Replan terms of SLA so that degree of SLA lies between max, min degree of SLA.

3. Stop.

III. PROPOSED METHODOLOGY

The core step which is re-planning adjustments in SLA's are done based on various factors .The first factor is potential threats to an IT system, services, operations. The second factor is to assess impact of a risk in business operations. The last factor is to find mechanisms and responses to these threats. As the above adjust factors are difficult to automate, initially we propose static values which can be extended to be more adaptive in future. If we consider planning at each business level so as to set SLA which are robust we need not spend time on replanning but as cloud computing services have their own challenges ,it is unavoidable to face this replanning activity. To balance this situation we develop a penalty management system for SLA's also .In negotiation process, penalties are requested by users to force compliance with SLA's. Penalty accepted by companies indicate the risk taking ability of the companies. Sometimes customers also agree on a penalty imposed on them depending on certain use cases. Penalty management system includes the concept of penalty fairness which balances the interest of both parties. Further, to achieve proportionality, penalties should reflect

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how far from the agreed QoS level an SLA has drifted. For example, one may consider an SLA where 90% of invocations of some operation are guaranteed to complete within 10 seconds. If 89.9% did so during the accounting period, the SLA is violated, but the penalty will typically be smaller than if only 80% of the invocations completed within 5 seconds.

IV. BUSINESS TERMS ASSOCIATED WITH PENALTY MANAGEMENT SYSTEM

Guaranteed states: These constitute acceptance by one of the parties that a certain parameter value will hold, e.g. Service Level Objectives (SLOs) or targets for Key Performance Indicators (KPIs).

Guaranteed actions: They are activities that, under certain circumstances, one of the parties:
• may perform; or
• is required to perform; or
• is not allowed to perform.

On the business layer, the following guaranteed actions have been defined:

Monitoring: This specifies which SLA parameters must be continuously monitored to control the information retrieved by the parties. Includes the units and frequency of monitoring.

Reporting: This represents the desire of the customer to be informed, automatically (push) or on demand (pull), about service usage and SLA status over time.
Since the information is sent as a report, this term includes information regarding the report format, the frequency (only push) and the exact delivery method.

Termination and Termination Clause: These represent the conditions under which one of the parties may terminate an SLA. A clause may include a notification method and a fee in case of unexpected cancellation.

Rewards are not addressed in the model; rather, it is assumed that in a realistic scenario, better service is more expensive by default.

Proposed Mathematical Model for expressing Penalty: Let us assume service S, and an SLA that governs consumption of this service by a certain customer. Also, assume that the total cost for consumption of the service under this SLA is T_c, and that the agreed QoS is given as a set of guarantees (Q_1, Q_2, ..., Q_n) for the various supported quality metrics and properties.

Then, a set of penalty functions is defined as:

$$P_m(Q_{1m}, ...,Q_{Nm}) = T_c \cdot PWm \cdot \Sigma\, QW_k \cdot FR_k \qquad (1)$$

where $m > 0$ and $1_m \leq k \leq N_m$.

$Q_{1m}, ...,Q_{Nm}$ represents a combination of guarantees that depend on each other, and the violation of one may affect, under specific circumstances, the others. This is a way to express correlations of fine granularity.

Thus, a customer can express statements wherein the violation of one guarantee becomes more relevant if another guarantee is also violated.

Pm is a penalty function that corresponds to the above combination $Q1m, ..., QN_m$ of guarantees. The sum of all penalty functions during one reporting period represents the total penalties for this SLA during that period.

PW_m is the weight of penalty function Pm. It indicates how important a function is to the total calculated penalty, and may aid the service provider in making decisions regarding the deployment and implementation of the SLA. The sum of all weights is equal to 1.

QW_k is the weight of one specific guarantee being violated, for this specific combination of guarantees. This value may be arbitrarily high. It allows the negotiating customer to express the importance of respecting certain guarantees in this penalty function.

Take, for example, a case where the guarantees concern the availability of two load-balancing servers. If the availability guarantee for one server is violated, its weight (and hence, the penalty) is kept small. If, however, the availability guarantee of the other server is violated at the same time, there may be a very high weight to suggest an equally high penalty as a result of the system becoming unavailable as a whole.

Finally, FR_k is the failure ratio: the relationship between achieved quality and planned quality. It indicates how far the offered quality has drifted from the agreed quality of a specific service parameter.

For instance, if 100% service availability was agreed to but only 90% is achieved, then the failure ratio is 0.1; if a 5 second average response time was agreed but a 6 second average response time is achieved, then the failure ratio is 0.2. By definition, FR_k may also model possible rewards for performing better than agreed.

V. FUTURE WORK

Our model does not capture sub contracts or their impact and work is in progress to include them. Also our model is insensitive about number of violations in SLA's .In certain domains this posses a considerable amount of impact in business structures. Our model also does account for network delays. But if the organizational size is large, communication delays should also be taken into account for calculation of penalties. In future we intent to make a framework which accounts for above mentioned factors and provide a even more robust model.

VI. CONCLUSION

Service level agreements while conducting business using cloud computing technologies is crucial to leverage the growth of a organization. Our paper envisions the intrinsic factors which have to be tuned to implement impartial service agreements.

We have proposed a model in which any type of unwanted issue attracts suitable degree of penalty too and we have also brought light into the deficiencies of the existing penalty management system. We conclude that significant work to eliminate this shortcomings are also initiated by researchers.

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