Service Management in Cloud using TPSLM Architecture

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Abstract

The frameworks that are currently present are not good enough to ensure a control on cloud computing environments. Emerging challenges of Service Level Management in cloud is described in this paper. Then it overviews the current state of business and it introduces a TPSLM architecture for CSPs and CSCs. Use of the TPSLM architecture results in a high service performance, shorter service delivery time and an impressive cost reduction.

Keywords: Cloud Computing, Cloud Service Consumers (CSCs), Cloud Service Providers (CSPs), Service level agreement (SLA), Service Level Management (SLM), TPSLM (third party Service Level Management) architecture

I. INTRODUCTION

Three solutions are discussed here as a solution to the problems to service level management in cloud. The first one is to adopt current SLM frameworks, for example COBIT, ITIL, TOGAF and ETOM. But it is inefficient to handle the dynamic cloud resources. The tools provided by the Cloud Service Providers are used as a second option. This will raise an out-of-control issue. A unified SLM framework is implemented as the last solution. Many frameworks and solutions have been introduced, but they produce partial solutions rather than giving an entire support for SLM in cloud. To solve this problem in cloud, this paper introduces TPSLM architecture, conceived for cloud services in public environments. The architecture covers the whole SLM cycle. It supports registering, discovery, selection, monitoring and billing and review of cloud services. This architecture enables lower management cost and higher efficiency of services. In section 2, SLM in cloud and emerging challenges are investigated and summarized. Section 3 considers the current state of business and illustrates studies on emerging challenges. Then TPSLM architecture is introduced in section 4.

II. CHALLENGES OF SLM IN CLOUD

The emerging challenges in cloud are described here

A. Inconsistent View of Cloud Services

The cloud services use different billing schemes with various performances. There are many CSPs providing similar services and the CSCs are not able to select a proper service from a good CSP. The CSPs are not providing comment portals for the users so that they can review the services. Even if they are providing comment portals they filter the received comments in favor to them. So the CSCs can barely discover the actual services they need. The security and the experience of the user cannot be easily measured.

B. Issues in Selection of a Service

SLAs are needed in organizations to control the cloud IT infrastructures. The cloud services has different layer such as SaaS(Software as a Service) which provide software applications which can be used by the consumer. The software would be run on cloud infrastructure and be accessible by means of a network accessing device. The PaaS(Platform as a Service) provide computing platform on which to run software of the consumer, which was created using the programming language and protocols supported by the specific platform. The IaaS(Infrastructure as a Service) provide processing, storage and other computer hardware related capabilities. Each of these three layers has different SLOs and requires different performance indicators. But the CSPs use same SLAs for all the three layers. There are many services with high cost but low performance and which have low cost with better performance. CSCs need to understand the relationship between performance and price to choose the right services.
C. Performance Evaluation and Accounting Favorable For Csp

Since the control of cloud services are with the CSPs, they can fake service performance and can avoid the penalties during the billing process. As a result, CSCs can barely understand the actual service performance and will cause trustworthy issues.

D. Immature Decisions

If any service violation happens or new cost-effective services are available then the existing service should be cancelled. As the business grows or declines new and better services must be made available by CSPs and if the current services are good enough it should be continued. However these decisions may be biased and misled, because of the lack of an overall view of services.

III. STATE OF ART

A. Current State of Business

For IT infrastructure (IaaS) service management frameworks like COBIT and ITIL are used. TOGAF and ETOM are used for service in SaaS layer. The current solutions for SLM in cloud are still inefficient. CSPs mainly control the SLA management and CSCs receive summarized performance indicators. Out-of-control becomes even serious based on the irregular and on-demand performance test reactions of CSCs. These issues actually prevent enterprises to migrate critical IT services to cloud and reduce the profit of CSPs.

B. Current State of Academy

CSPs want high quality services stabilizing their market shares and CSCs want purchased services running with defined SLs. Two main concepts of CSPs are:

1) Federation: In federation extra service requests are completed with the help of cloud computing partners. For example, let cloud X and Y are partners and in peak time, when SaaS in X requires more resources, the SaaS of partner Y is invoked for getting the extra resources.

2) Delegation: The capability of underlying layer services to serve additional requests is increased here. For example, a SaaS enhances underlying IaaS to handle additional incoming requests.

C. Solutions for Emerging Challenges

1) On Service Selection

The best cloud services can be found using SMICloud. In SMICloud, 7 Service Measurement Index are there , Accountability, Agility, Assurance of Service, Cost, Performance, Security and Privacy, and Usability, are defined to a) evaluate services by analyzing promised and actual service performance, and b) rank services by matching the performance provided by CSPs and required by CSCs.

2) On Performance Evaluation

Lattice Monitoring Framework is designed and built for the purpose of monitoring the service performance in cloud. Specifically, RESERVOIR (a service cloud to orchestrate services and computing resources) is integrated in the framework to monitor cloud services. It enables the framework to efficiently coordinate measurement probes for data collection.

3) On Accounting

A Cloud Computing Accounting Model is proposed to support a flexible accounting process. It supports various cloud services. It chooses Internet Protocol Detail Record (IPDR) as a standard data format to record the usage of services. Finally, jBilling is used as an accounting platform.

4) On Disclosing the Performance of Cloud Services

Dwarf benchmarks are used to identify application performance. It proposes that a set of Dwarf benchmarks can ultimately be the standardized measurement of the performance of cloud resources. Currently, only IaaS is supported by this mechanism.

These solutions 1) solve issues of SLM in cloud in an isolated way, 2) are not flexible for various scenarios, 3) diversify the managed process, which will cause new issues. So a general solution is required, which should comprehensively support SLM in cloud and easily be deployed and used.

IV. TPSLM ARCHITECTURE

In order to comprehensively support SLM in cloud and overcome emerging challenges, TPSLM architecture is designed. The key components of the framework are:

A. Cloud Service Register (CSR)

Here the CSP can publish and update their cloud services. It contains two components Service Analyzer and Service Verificationer. Service Analyzer analysis the incoming cloud service description file based on a defined XML notation. Then the
Service Verificer will categorize the service based on the properties and update Service Repository accordingly. If all the above process finished successfully, the new cloud service is available in the repository. CSR will send a feedback to CSPs to indicate that the service has been registered or not.

B. Negotiation Agent (NEA)

NEA has 2 components, Service Requirement Analyzer and SLA Generator. The Service Requirement Analyzer selects the best service based on the service capability, performance and price. The CSP providing that service is also selected. Then SLA Generator will select proper template from SLA repository to fill a contract proposal and sent it to both CSPs and CSCs. The CSCs can send their requirements and according to the feedback, the contract is revised. After several steps final contract is generated. After validation it is stored in SLA repository. During the negotiation process, CSCs need to send their service requirements. CSPs and CSCs will receive contract proposal and final contract, and provide feedbacks for SLA updating.

C. Service Monitoring Engine (SME)

Service Monitoring Engine (SME) monitors and manages the contracted services. SME have two key components, Performance Monitor and Performance Analyzer. Performance Monitor collects the monitoring data. The monitoring mechanisms are different since the cloud services are in different layers. So monitoring data are collected using following mechanisms

1) API from CSPs: CSPs provide some monitoring APIs and performance data can be collected by invoking such APIs. Used in PaaS and IaaS layer.
2) Session simulation: Since no APIs are available in SaaS layer, to collect performance data, session simulation simulates user sessions.
3) Network traffic mirroring: It is a technology to collect network data for either basic network status analysis, e.g. average response time.
4) Probing: it requires more complex implementation. Particular measurement probes need to be implemented in services to support the probing activity.

After the performance data are collected, Performance Analyzer evaluates actual SLs and detect SLA violations. Once the violations are detected it will send SLA violation report.

D. Accounting Agent (ACA)

Accounting Agent (ACA) analyzes actual SLs and SLA violations and generates a fair bill. If a SLA violation happens, it will be counted in the bill according to compensation rules.

E. Service Review Agent (SRA)

SRA rank similar services, motivate CSPs to enhance their services and give a better service solution to CSCs. It provide portal for personal comments. It sends review reports to CSPs so that the CSPs can improve their services.

F. Data Repository (DAR)
Data Repository (DAR) is for storing data in the framework. It consists of five repositories Service repository to store registered cloud services, SLA repository to store contracts, defined SLAs and SLA templates, Monitoring Data repository to store monitoring data of on-used services, Performance repository to store performance analysis results and SLA violation instances, Review repository to store review data and Accounting repository to store bills and penalties.

V. CONCLUSION

A third party Service Level Management architecture is introduced to solve the issues caused by the service discovery, selection and management process of Service Level Management in cloud. This architecture meets the typical requirements of Service Level Management in cloud, as the strong delegate between Cloud Service Providers (CSPs) and Cloud Service Consumers (CSCs).

REFERENCES