Chapter 6
SLA Management in Storage Clouds

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ABSTRACT

The need for online storage and backup of data constantly increases. Many domains, such as media, enterprises, healthcare, and telecommunications need to store large amounts of data and access them rapidly any time and from any geographic location. Storage Cloud environments satisfy these requirements and can therefore provide an adequate solution for these needs. Customers of Cloud environments do not need to own any hardware for storing their data or handle management tasks, such as backups, replication levels, etc. In order for customers to be willing to move their data to Cloud solutions, proper Service Level Agreements (SLAs) should be offered and guaranteed. SLA is a contract between the customer and the service provider, where the terms and conditions of the offered service are agreed upon. In this chapter, the authors present existing SLA schemas and SLA management mechanisms and compare various features that Cloud providers support with existing SLAs. Finally, they address the problem of managing SLAs in cloud computing environments exploiting the content term that concerns the stored objects, in order to provide more efficient capabilities to the customer.

DOI: 10.4018/978-1-4666-3934-8.ch006

OVERVIEW

The evolution of Internet provides a platform for using IT services. Many transactions are executed by Web services, such as data storage, online purchasing etc. Companies, media, and other fields need to store large amount of data, to retrieve data and/or to exchange data online from any geographic location anytime. The need of a formal contract for describing what functionalities are provided and under which terms (e.g. cost, conditions, obligations, etc.) is essential.
The document that captures that information is commonly referred as Service Level Agreement.

A Service Level Agreement (SLA) is an agreement between the provider and the consumer of the service that specifies the function performed by the service, the obligations on both the provider and the consumer, the agreed-upon constraints of performance (QoS) for the service, and how deviations are handled (exceptions and compensation). In this sense, an SLA is a contract between the participants in the service, which are typically the provider and the consumer, but can also include mediators or other actors that are stakeholders in the service lifecycle.

An SLA is made in some business context, which may include decisions made by each party leading up to the agreement, the presence of an endorser for the agreement and simply some prior conditions that make the terms of the agreement acceptable by both sides. An SLA is typically established before deploying a service and covers the whole lifecycle including execution and monitoring through decommissioning. However, it is also possible to form an SLA with an existing service, e.g. through a federation process orchestrated by an existing consumer that produces new interactions with other consumers. SLAs therefore have a huge influence on all aspects of the service, from as early as design time, to the infrastructure the service is deployed and executed on and the monitoring components that will be required for the provider to successfully offer a service. While many aspects of context following the creation of an SLA can be shared or agreed (e.g. roots of trust, expected QoS, etc.), some should not (e.g. no commercial service provider is likely to reveal their resource plan to a consumer).

Currently, cloud providers tend to use existing monitoring tools from other environments, such as Grid. The disadvantage is that these tools do not cover all the needs of the cloud environments. Most of them are restricted to locality and homogeneity of monitored objects, are not scalable, and do not support mapping of low-level resource metrics (e.g. uptime and downtime) to high-level application SLA parameters (e.g. availability). What is more, current cloud storage providers offer SLAs (Amazon S3; Windows Azure; Nirvanix) that only guarantee service availability and they give service credit or refunds for lack of the agreed availability.

In the following sections, we will present some state-of-the-art scientific proposals for SLA schemas and mechanisms. Additionally, the features that are supported by the most known Cloud providers are analyzed. Finally, the proposed SLA Management in Cloud environments developed in VISION Cloud is presented.

**BACKGROUND**

In this chapter, we consider SLA for storage cloud services which store and manage the data for customers by a third party.

The SLA is the service level agreement between the user and the service provider, where the level of a service is formally defined. Some of the elements that are defined in the SLAs are the parties involved, the contract date, the terms of agreement and the data cost. The properties that are used in the terms of agreement can be divided in functional and non-functional. The latter can contain quantitative (e.g. availability, durability, latency) and qualitative properties (e.g. adherence to safety properties and absence of deadlocks and livelocks). The quantitative properties are constrained through thresholds, commonly named as Service level objectives (SLOs).

A lot of research and protocols have been done as far as Service Level Agreements (SLA) and the SLA Management are concerned.

SLA schemas are XML schemas that represent the content of an SLA. Some existing approaches for SLA schemas and the corresponding languages to define service description terms are: WS-Agreement (Andrieux, et al., 2005), SLAng (Lamanna, et al., 2003), WSLA (Keller & Ludwig, 2003), WSOL (Tosic, et al., 2003), and SWAPS (Oldham, et al., 2006).