A Survey of Cloud Storage Systems

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Abstract

Cloud Storage Systems have been under research and development for a long time in both industrial and academic world, exemplified by Amazon Simple Storage Service (S3) [1], Amazon Elastic Block Store [2], Nimbus Cumulus [3], Hadoop Distributed File System (HDFS) [4], etc. These systems provide extendable storage solutions to both cloud applications and virtual machine instances hosted in clouds, and thus play an important role in cloud computing environments, especially for solving data intensive computing problems. However, there has been no comprehensive taxonomy and description about these systems, and users may find it hard to choose appropriate services for their specific use cases or problems.

This poster will present our work on a survey of cloud storage systems. We investigated commercial products for cloud storage services such as Amazon Web Services [5] and Windows Azure Platform [6], and proposed the taxonomy as shown in Table 1. Each category of services have their specific targeted use cases. For example, while object storage services are suitable for storing VM images and large files, block storage services are mainly used to extend the disk space of running VM instances.

Based on this taxonomy, we surveyed existing open-source cloud computing systems, including Nimbus [3], Eucalyptus [8], OpenNebula [9], OpenStack [10], and identified the type of storage services provided by these systems. Moreover, we tried to analyze the architecture and implementation details of their storage systems, and compare them in terms of functionality, reliability, and scalability.

This poster will describe our taxonomy, demonstrate typical use cases of each type of cloud storage systems, and present our analysis on the storage services provided by both commercial and academic cloud platforms. We hope our work can provide both a detailed reference for cloud users, which can help them choose the proper services for their problems, and a good starting point for researchers interested in this area.

10. References

[1] Amazon S3, http://aws.amazon.com/s3/.
[2] Amazon EBS, http://aws.amazon.com/ebs/.
[3] Nimbus project, http://www.nimbusproject.org/.
[4] K. Shvachko, H. Kuang, S. Radia, R. Chansler, " The Hadoop Distributed File System", Proceedings of IEEE MSST 2010, Incline Village, NV, USA, May 2010.
[5] Amazon Web Services, http://aws.amazon.com/.
[6] Windows Azure Platform, http://www.microsoft.com/windowsazure/.
[7] Amazon RDS, http://aws.amazon.com/rds/.
[8] D. Nurmi, R. Wolski, C. Grzegorczyk, G. Obertelli, S. Soman, L. Youseff, D. Zagorodnov, "The Eucalyptus Open-Source Cloud-Computing System", Proceedings of CCGRID 2009, Shanghai, China, May 2009.
[9] B. Sotomayor, R. S. Montero, I.M. Llorente, I. Foster, " Virtual Infrastructure Management in Private and Hybrid Clouds", J. IEEE Internet Computing, vol. 13, no. 5, Sept.-Oct. 2009.
[10] OpenStack, http://openstack.org/.

Table 1 Taxonomy of Cloud Storage Systems

Category	**Definition**	**Example**
Instance storage	Storage coming with the file system on VM instance images.	Amazon EC2 instance storage
Object storage	Storage of binary objects provided in the form of Web services.	Azure blob
Block storage	Virtual block devices that can be attached to VM instances and used as if local disks.	Amazon EBS
Semi-structured data storage	Database service for storing semi-structured data with high availability, high scalability, and high performance.	Hadoop HBase
Relational database storage	Relational database servers running on VM instances.	Amazon Relational Database Service [7]
Distributed file system	Distributed storage provided through file system interfaces with high availability and high scalability.	Hadoop Distributed File System
Online drive/ folder service	Storage space provided in the form of a virtual drive or folder on Internet.	Microsoft SkyDrive