USTO.RE: A Private Cloud Storage System

Frederico Durão[1], Anderson Fonseca[2], Vinicius Garcia[2], Rodrigo Assad[3] e Thiago Vieira[2]

[1]Instituto de Matemática, Departamento de Ciências da Computação (UFBA)

[2]Cin – Centro de Informática – UFPE

[3]Universidade Federal Rural de Pernambuco - UFRPE

Related works

There are a number of platforms in the cloud data storage[3], the most of which have common features: i) the need to assemble a dedicated infrastructure to ensure the availability of data when the user requests access; or ii) the lack of reliability from the standpoint of ensuring the availability of data, which can be clearly identified from the analysis of contracts of service providers.

The main advantage in the USTO.RE approach stay into reduce or fit the company budget related to the total cost ownership, associated to new storage units acquisition, as a mean to use of the idle hard disks spread into company machines.

Table 1. Comparisons of related works

Solution	Replication strategy
Amazon S3 [1]	Servers (3 copies)
Megastore [2]	Servers
MSFSS [5]	Servers (2 copies, configurable)
HDFS (Hadoop) [4]	Servers, it could be generates excessive replicas
USTORE	Simple peers based upon its availability history

As shown in Table 1, these solutions infer the need to purchase infrastructure in order to provide a dedicated service aiming to take replicas. In order to improve this scenario, USTO.RE aims at providing the cloud data storage created over the P2P technology followed by the needs to establish the data federations to taking consistent replicas.

Benefits

To define a storage system through the cloud computing concepts;

To provide a low cost alternative for data storage at small and medium companies, the hardware are commodities;

Uses idle hard disk space into the computers already acquired by company using as means as peer-to-peer technology;

The USTO.RE can be accessed by Desktop, Web and Mobile User Graphical Interface, besides to provide an API using REST for integrate another systems such as EEUU/OpenBIO project;

Scalable services on demand;

Overall systems configuration by Admin console, such as: queue and chunk size, user profiles for the file replicas and reports generation.

Peers grouping accordingly its roles checked based upon the proximity between another nodes.

Security using AES algorithm for encryption.

Acknowledgments

Ustore SMART STORAGE CLOUDS

INES

EU-Brazil OpenBio

CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico

The USTO.RE

The architecture of USTO.RE was designed envisioning a set of quality attributes aligned to distributed storage systems nature and comprising the main benefits offered by P2P architectures, such as: scalability, resources optimization, availability, and lately, security.

The Figure 1 depicts the USTO.RE architecture as well as its deployment viewpoint, which comprises a set of components structured where each ones has different roles to perform to.

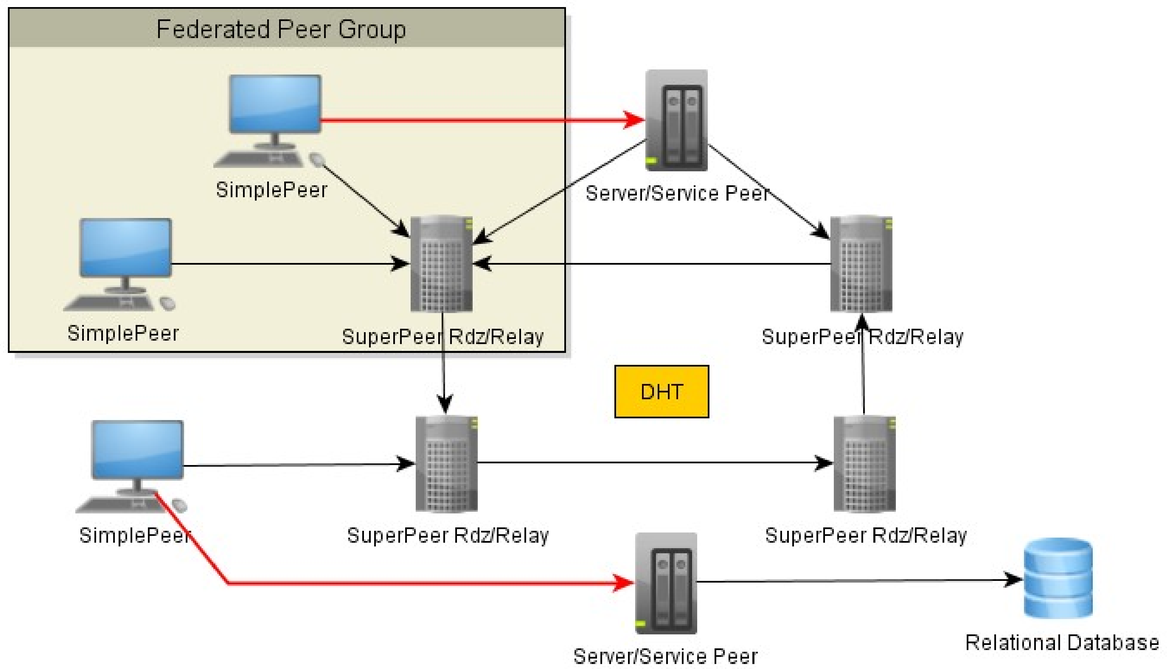

Figure 1. USTO.RE Architecture

SimplePeers are client peers containing the basic services to perform backup and restore files, besides that, it stores the chunks sent by anothers peers. In high level view, that peers represents the common user machines, offering idle hard disk space limited by system administrator. Each one has an availability defined profile when initially connected to the network to contributing to calculate the network overall availabilty to take file replicas.

SuperPeer/RdzRelay to permit the simplepeer to connect to peers behind the firewall besides to control the overall connected peers through the network. In that, it is possible to define peers federations at extent that peers to connect in the system.

Server/Service Peer has the main services to the USTO.RE function properly such as: Authentication, Availability, Chunk, FileDirectory, FileManager, Search and MessageController. The server utilizies a relational database to track control over files and chunks available, users file sharing and user info. Thus, that service peer was conceived as a peer containing a portion of specifics roles in the peer-to-peer model instead that server known in client-server model.

Evaluation

Chunks/Queue	Time	Chunks/Queue	Time
128/10	00:03:20	32/10	00:12:03
128/8	00:03:08	32/8	00:14:53
128/6	00:04:54	32/6	00:18:50
128/4	00:06:22	32/4	00:22:59
128/2	00:13:15	32/2	00:59:19
64/10	00:05:46	16/10	00:23:17
64/8	00:07:32	16/8	00:30:00
64/6	00:10:15	16/6	00:32:15
64/4	00:12:02	16/4	00:47:49
64/2	00:03:20	16/2	02:03:10

Figure 2. Meantime Chunks/Queue

The load test was defined as below:

- 3 machines sent 2000 files each one 500KB.
- 6 machines sent 500 files each one 5MB.
- 3 machines sent 50 files each one 50MB.
- 3 machines sent 5 files each one 200MB.

References

[1] Amazon. Amazon Simple Storage Service (Amazon S3), March 2012. URL: http://aws.amazon.com/pt/s3/, last access 05-Mar-2012.

[2] J. Baker, C. Bond, J. Corbett, J. J. Furman, A. Khorlin, J. Larson, J.-M. Leon, Y. Li, A. Lloyd, and V. Yushprakh. Megastore: Providing scalable, highly available storage for interactive services. In CIDR'11, pages 223–234, 2011.

[3] G. DeCandia, D. Hastorun, M. Jampani, G. Kakulapati, A. Lakshman, A. Pilchin, S. Sivasubramanian,
P. Vosshall, and W. Vogels. Dynamo: amazon's highly available keyvalue store. SIGOPS Oper. Syst. Rev., 41:205–220, Oct. 2007.

[4] K. Shvachko, H. Kuang, S. Radia, and R. Chansler. The hadoop distributed file system. In Proceedings of the 2010 IEEE 26th Symposium on Mass Storage Systems and Technologies (MSST), pages 1–10. IEEE Computer Society, 2010.

[5] L. Yu, G. Chen, W. Wang, and J. Dong. Msfss: A storage system for mass small files. In W. Shen, Y. Yang, J. Yong, I. Hawryszkiewycz, Z. Lin, J.-P. A. Barthes, M. L. Maher, Q. Hao, and M. H. Tran, editors, 11th International Conference on Computer Supported Cooperative Work in Design (CSCWD), pages 1087–1092, Los Alamitos, CA, USA, April 2007. IEEE Computer Society Press.