

A Study on the Future Storage System as brain coordinator

Cheon-Hee Yi[†] and Jae-Young Yi

[†]Dept of Electronic Engineering, Chong-ju University

ABSTRACT

In this paper an attempt for realizing a storage system which works as a part of human brain has been discussed. The system is expected to be able to coordinate with human brain. And current storage may have inherent problem due to an intrinsic attribute of storage, exclusiveness. Directory structure in it must be a source of confusion, if it used out side of the range of limitation. Adapting multidimensional annotation of file name extension and directory-less file system, a new storage system able to associate and coordinate with human brain may be available near future. This paper showed that the limitation of current storage system clearly exists, because of human brain limitation to memorize directory name.

Key Words : Storage, File System, Directory Associative, Metadata, Multidimensional File, Brain Coordinator

1. Introduction

1.1. Intrinsic Attributes of Storage

Computer storage has been treated as a part of computer I/O and tightly linked to the file system of the operating system in general small system. The need for large-scale storage systems is becoming obvious; a study estimated that over five exabytes of data was produced[1] in 2002, an increase more than 30% over the previous year. Furthermore, accounting for 37% of all stored data, and was expected to surpass mutable data by the end of 2004. This is unsurprising, especially in the face of the over 10,000 legal regulations placed on companies in the U.S. for corporate compliance[2]. The storage for compliance even before some of the most demanding regulations, such as the Sarbanes-Oxley Act, went into effect. Also the need for ubiquitous storage accessibility mandates a re-look at the traditional DAS(Direct-Attached Storage) like storage architectures.

Since 1990 a few of dedicated storage systems have been introduced in the market independent of host computer. They have deserved well of the information to specialist related to ISP or professionals

who work for large sized enterprise. Near future 10Terabyte low priced storage system may be available in the general public domain. Storage management is an important problem in building future storage system[3,4]. More and more systems introduce metadata servers(MDS) or a metadata server cluster to organize data. in the field, some works have been done at file system level. But the current storage system is not adequate to handle large number of entries the same as its ancestor.

Let us take a look closely on the environment of the current large sized storage system and with combining the behavior of general user. To understand their storing behavior it is beneficial to find intrinsic attributes from animals.

For example, let us choose 3 different species of animals, acorn woodpecker, squirrel and pirate. To store their belongings, they try to find safe place. Acorn woodpeckers make an acorn size hole to store their acorn, not to slip down, and deep enough not to have it stolen and store it deeply accessible only by them. Squirrels do the same way as woodpeckers and covers with dirt and leaves. Pirates store their treasure in a secluded island and carry a map for later access.

From their behavior, we can see some common facts, location, volume, exclusion, concealment, accessibility. The words concealment and accessibility

[†]E-mail : yicheon@cju.ac.kr

may be fundamental attribute, and the rests are intrinsic attributes of storage with storing itself. .

Exclusion may be a major problem source of computer storage.

For example, in the real world, to store oil, potato and apple, we need bottle for liquid, sag for potatoes and box for apple. Choosing containers are to be exclusive each other and not to be mixed up. And then we may want to put labels olive oil, potato and apple on each of the container. Under the labeling action, we may see two intrinsic attributes, concealment and accessibility which contradict each other.

Let us do the same thing in the computer with the same file name. We may instinctively duplicate it as real world. Is there any chance to be mixed up? Not at all, but still we want to assign some container, directory unconsciously, instinctively. Assigning directory and putting labels may produce major problems in the computer system.

2. Limitation of current computer and limiting factor

2.1. Defining the limitation of current storage and limiting factor

including locality and access statistic. To organize the information efficiently and satisfy diverse application needs, the design of metadata server is composed of variety of allocation schemes and algorithms. Let us define "limitation of storage". Nowadays information oriented society many individuals use storage itself to store information from other sources intentionally and retrieve them later. In the procedure, we assign proper file name and directory name to store. Doing this repeatedly again and again, we finally reach a limiting point not to retrieve any more without tool. If one has to use search program to find it, one should select the file in the directory >>>>It is light

If one has to use search program to find it, one should select the file in the directory. But the file he found is not right one >>>>>>>>>>It is heavy

If one has to use search program to find it, one should select the file in the directory. But the file and

directory name is not what he wanted, complete lost. >>>>>>>>>> It is serious.

As a matter fact the limitation is not clear cut. And the user may not notice the limitation until he reach the serious stage. After searching it, the results are not the one wanted, lost completely.

2.2. The reason why the limitation happens

First we may have brain limitation to memorize the directory names up to a certain level.

* Some directory name could be made incautiously without leaving enough clues for the data.

* Some directory name could be made intentionally to cipher not to allow other to access or just encoded.

* Some directory name could be made improperly from array.

Each of the cases or combination of the cases may be caused of the limitation. All these are from the intrinsic attribute, exclusiveness, of storage. And the action may be unconsciously done under the guidance of concealment and accessibility of the fundamental attributes of storage. Some case concealment is to strong then the directory name and file name will need decipher or decoder. In old day, pirates have chosen island to conceal and left map to access later. If we any problem on storage, it may be originates from the exclusiveness of intrinsic attribute of storage. In the case of computer Many the operating system provide us with the directory structure.

2.3. Finding a solution for the limitation

Let us observe a storage user behavior. The file name usually partly express what the contents means. The storage user can memorize some amount of file names with abbreviated clue. And when he sees the name list, he can imagine the contents form the name. But making directory is different story. It seems very simple, because storing behavior is from action on instinct and it enforces to the user finding a container and hiding it. Making directory is not necessary activity in the computer storage, but is a source of confusion surely.

Actually the major problems using storage are originated not from user, but from file system

structure itself. Good solution may be not use directory.

3. Next Generation Storage System

3.1. Associative and Coordinative to Human Brain

At present, the prevailing system architecture for mass storage system is Object-based Storage architecture[5]. To handle the workload requested by tens of thousands of clients, metadata should be set properly to take full advantage of the MDS(MetaData Server) cluster[6]. Metadata is critical in the large distributed object-based storage systems. Traditional MDS cluster suffers from frequent metadata access and metadata movement within the cluster[7]. Although the size of metadata is relatively small compared with the overall capacity of the storage system, according to research, 50% of all file system operations are metadata operations. So carefully designed metadata management strategy is needed. Nevertheless, the workload can dynamically change in every MDS. Furthermore, thousands of clients may access a same file simultaneously or over a short period of time[8].

Human brain may function similarly as a sort of memory, but not as storage. Storage means outside of human body, but memory may inside of it or in the brain. If one can make computer storage associative, it can be a coordinator of one's brain. Current storage system is impossible to associate or coordinate with our brain[1], because the file is not observable directly. The directories block our sight from the

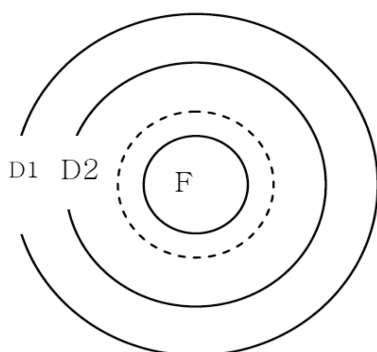


Fig. 1. Directories block vision.
F: File, D1: dir1, D2: dir2

file[Fig. 1].

If a storage system allows directories in the file system, the directories are an obstacle to associate. Then a storage system to be associative, the file should be visible directly not by indirect tool or program. Directory-less should be necessary condition for storage to be associative. To be a good partner of human brain for association, a bunch of file information should be located as close as possible. And to be coordinative, the file name itself should be more comprehensive, and be it as deep as possible.

So that the file name for future storage should be comprehensive and be multidimensional structure [Fig. 2].

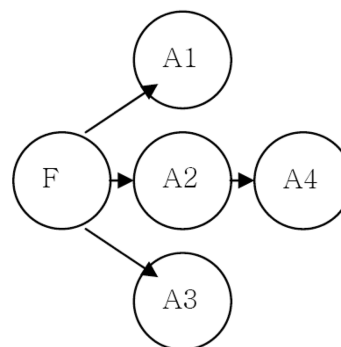


Fig. 2. Future Storage with Associative Attribute
F: File, A1: attribute1, A2: attr2, A3: attr3, A4: attr4

Multidimensional file annotation[9] should have multiple arms to stretch relevant information like vector form. How many attribute arms and how deep the arms are user's choice. Filling up attribute arm with some information by the storage user and it is analogy with education. And the processes, associations, comparison, and imagination, all these may belong to storage user's brain activity. All the activity of user brain with the data in the associative storage can be define as brain coordination. If a group of people build a information structure in a computer with their knowledge and idea from individual, each member's brain can share it. And then it can coordinate with the storage and coordinate among other member's brain. It could be an efficient way for people to be educated. The brain coordinator storage will be next generation storage to be brain intimate

storage free from problem of data access and free from the problem originated limitation of file entries. Therefore extremely large size storage system structured by brain coordinator will be helpful for individuals and group workers to maximize their brain capability and for their creative work.

3.2. Essential attributes

Now what kinds of information package vector axis or attribute-arms are essential to match human brain?

First axis could be time. It is helpful for the user with accurate clock to show the range of view, and later it will be more useful.

Owner, creator and transferee axis is second and location axis is third. Above axis may be useful for file handle tool. Most significant axis would be for seeing image and hearing the sound. Next would be descriptive axis for more details.

4. Conclusion

In this paper showed that the limitation of current storage system clearly exists, because of human brain limitation to memorize directory name.

The major factor of the limitation is due to the existence of directory structure in the file system and using them. These facts are originated from intrinsic attribute of storage perception. Removing directories in the current storage system could reduce the range of problems to safer side. Further more, it may bring forth a new storage system by combining multidimensional file name annotation. The new storage system can be associative or brain coordinator of which functional structure is similar to human brain.

Conclusively A storage system adapted with the multidimensional file attribute and without directory may be closest candidate of performing association and coordination with human brain. This type storage system will enhance the human brain capability and the quality of it. And will be helpful for people to utilize more creative.

Also it may possible to make storage of which system allows to co-exist the current storage function

with directory and future storage function like brain coordinator to be associative. Next study will be targeted this subject.

REFERENCE

1. P.Lyman, H. R. Varian, K. Searingen, P. Charles, N.Good, L.L. Jordan, and J.Pal. How much information? 2003. <http://www.sims.berkeley.edu/research/projects/how-much-info-2003/Oct.2003>.
2. The Enterprise Storage Group. Compliance: The effect on information management and the storage industry. <http://www.enterprisestoragegroup.com/>, 2003.
3. A. C. Veitch, E. Riedel, S. J. Towers, J. Wilkes. "Towards Global Storage Management and Data Placement", Eighth IEEE Workshop on Hot Topics in Operating Systems (HotOS-VIII), pages 184-184. IEEE Computer Society Press, May, 2001.
4. Sage A. Weil, Kristal T. Pollack, Scott A. Brandt and Ethan L.Miller. "Dynamic Metadata Management for Petabyte-scale File Systems", Proceedings of the 2004 ACM/IEEE Conference on Supercomputing (SC '04), Pittsburgh, PA, November, 2004.
5. Thomas M. Ruwart, "OSD:A Tutorial on Object Storage Devices", Proceedings of the 19th IEEE/10th NASA Goddard Conference on Mass Storage Systems and Technologies(MSST2002).
6. S. A. Brandt, L.Xue, E. L. Miller and D. D. E. Long, "Efficient Metadata Management in Large Distributed File Systems", Proceedings of the IEEE/11th NASA Goddard Conference on Mass Storage Systems and Technologies, Apr2003, pp.290-298.
7. Jie Yuan, Yao-Long Zhu, Hui Xing, Renuga Kanagavelu, Feng Zhou and So LihWeon, "A Design of Metadata Server Cluster in Large Distributed Object-based Storage", In Proc. of the 23st IEEE/14th NASA Goddard Conference on Mass Storage Systems and Technologies (MSST2006).
8. Jin Xiong, Rongfeng Tang, Sining Wu, Dan Meng, Ninghui Sun, "An Efficient Metadata Distribution Policy for Cluster File Systems", In Cluster Computing 2005. Sept2005, pp.1-10.
9. Haksong Simon Park, "Multidimensional File in Brain Coordinator" Internal Memo, Silicon Modular Network, Inc., May, 2002.

접수일: 2009년 3월 3일, 심사일: 2009년 3월 11일
 게재확정일: 2009년 3월 13일