On Construction of a Large File System Using PVFS for Grid

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Abstract. Grid is the largest advance of network after Internet since the Grid System provides a specialty that can be used popularly and effectively. However, it is a challenge to the consistency and community of use on the data storages space of a Grid System. Therefore, the problem of application for the Computational Grid and Data Grid is more important. It can set up a usability, expandability, high operation capability, and large memory space in Grid with the Cluster system and parallel technique in order to solve the problem. In this paper, we provided a Grid with high operation capability and higher memories to solve the problem. As to the Grid setting, we take use of the Cluster computing to increase the operation effect for computing, and a PVFS2 with more storages effect for data. It can supply a quite correct platform for Grid user whether for large data access or huge operation.

Keywords: Cluster, Grid Computing, Data Grid, Parallel Virtual File Systems.

1 Introduction

High performance, distributed computing and computational sciences require large data sets, fast and efficient ways of getting to that data, and a security model that will protect the integrity of the stored data. In order to create enough usable space without spending large amounts of money for storage, multiple storage servers need to be used in groups.

Grid computing is a form of distributed computing that involves coordinating and sharing computing, application, data, storage, or network resources across dynamic and geographically dispersed organizations [1,2, 3, 4, 5]. Grid technologies promise

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to change the way organizations tackle complex computational problems. However, the vision of large scale resource sharing is not yet a reality in many areas - Grid computing is an evolving area of computing, where standards and technology are still being developed to enable this new paradigm.

Data grids are used to provide secure access to remote data resources: flat-file data, relational data, and streaming data [7, 8]. For example, two collaborators at sites A and B need to share the results of a computation performed at site A, or perhaps design data for a new part needs to be accessible by multiple team members working on a new product at different sites and in different companies.

Grid is a great progress of network after Internet because the Grid System provides a specialty that it can be used popularly and effectively. It can set up a usability, expandability, high operation capability, and large memory space in Grid with the Cluster system and parallel technique in order to solve the problem. In this paper, we provided a Grid with high operation capability and higher memories to solve the problem. As to the Grid setting, we take use of the Cluster computing to increase the operation effect for computing, and a PVFS2 with more storages effect for data. All the system use the Channel Bonding method to raise the effect of data reading, writing and transmission, so that it can provide a higher memories effect.

2 System Model

The PVFS is an effort to provide a parallel file system for PC clusters [6]. As a parallel file system, PVFS provides a global name space, striping of data across multiple I/O nodes, and multiple user interfaces.

The system is implemented at the user level, so no kernel modifications are necessary to install or run the system. All communication is performed using TCP/IP, so no additional message passing libraries are needed, and support is included for using existing binaries on PVFS files.

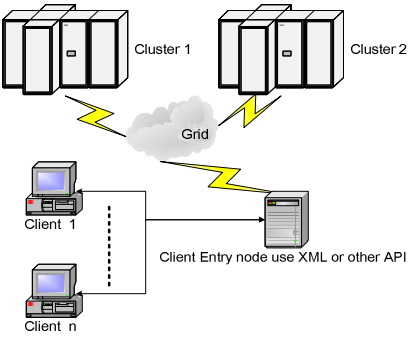

Fig. 1. Our system architecture

First, we use four dual processors PC (SMP structure) with 60GB of hard disk; divided into 10GB installation system, the rest 50GB is provided for PVFS use, total

4 PCs have 200GB capacity space. Because the setting of PVFS2 Linux OS Kernel needs a 2.6.x, we adopt Mandrakelinux-10.0-Community version, the Kernel is 2.6.3 version, MPI 6.5.9.

We set up two Cluster systems in the system, each Cluster is equipped with Linux OS Kernel 2.6.3, and set up NFS, NIS and MPI-2.0 in order to present the feature of whole set of cluster as shown in Figure 1. Therefore, in Client1 group, we can get the divided hard disk capacity of each Client 50GB, the total hard disk capacity of 4 PCs is 200GB, as to the Cluster2 group, the hard disk capacity is 150GB. Further, the Host of each group has Globus Toolkits 3 version [7] for connecting via Grid system. We use the real IP of Host IP for the two systems, which have transmitted to the simulating remote terminal IP (in fact, to link Globus PC should have a real IP) in order that the outer terminal of Client can pass through GridFTP or XML direct access the space shared by Cluster1 and Cluster2.

3 Experimental Results

Whether install PVFS2 on Cluster1 and Cluster2 groups to form a group, its step is as follows actually in us. Take Cluster1 as an example.

Step1. Building and installing the packages
Step2. Server configuration
Step3. Starting the servers
Step4. Client configuration
Step5. Testing your Installation

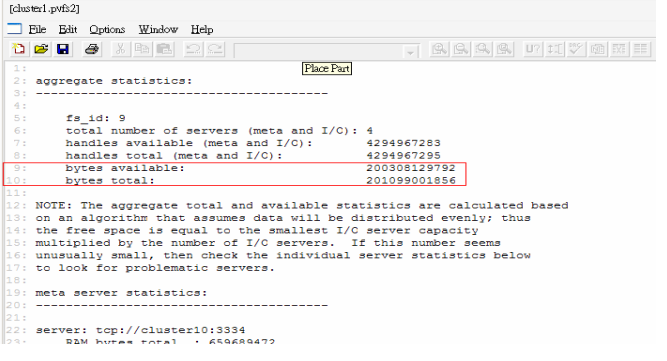

Fig. 2. Results list of Cluster1

We successfully obtain our projected capacity: Cluster1 have 200,308,129,792 bytes available, Cluster2 have 152,531,263,488 bytes available. (Figures 2 and 3), the capacity is small than SAN or NAS, but we assure that the capacity of the said system can be very large due to good hard disk.

Our experiment expressed that it can additionally provide a large storages space in Computing Grid surely. We established a platform of large storages for supplying to

GridFTP, Avaki [8], something like DataGrid middleware or use XML's DataGrid Access Software Application by himself.

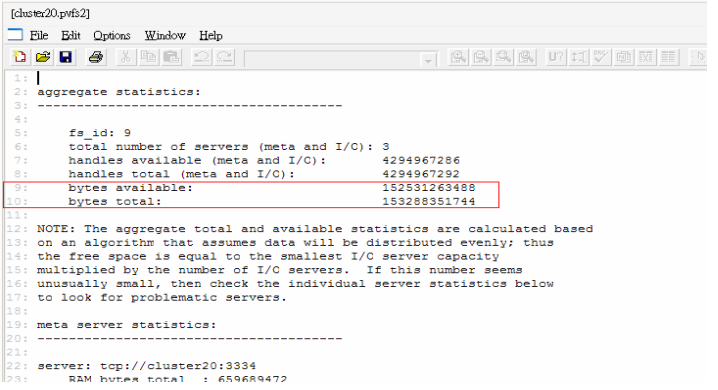

Fig. 3. Results list of Cluster2

4 Conclusion and Future Work

As the internet bandwidth is increasing constantly, the PVFS is used in Local, now, it accesses to the whole world gradually, in opposition, and the security question is the primary guiding principle in the future. There is a quite space to improve in this system, such as: how to combine the capacity of Cluster1 with Cluster2, although it didn't be experimented, we conduct a well design method. We have the confidence that we can create a more big space for DataGrid.

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