

FIRST EXPERIENCE WITH VMWARE SERVERS AT HLS

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Abstract

Hefei Light Source(HLS) is a dedicated second generation VUV light source, which was designed and constructed two decades ago. In order to improve the performance of HLS, especially getting higher brilliance and increasing the number of straight sections, an upgrade project is undergoing, accordingly the new control system is under construction. VMware vSphere 4 Enterprise Plus is used to construct the server system for HLS control system. Four DELL PowerEdge R710 rack servers and one DELL Equallogic PS6000E iSCSI SAN comprises the hardware platform. Some kinds of servers, such as file server, web server, database server, NIS servers etc. together with the softIOC applications are all integrated to this virtualization platform. The prototype of softIOC is setup and its performance is also given in this paper. High availability and flexibility are achieved with low cost.

INTRODUCTION

Hefei Light Source (HLS) is a dedicated second generation VUV light source, which was designed and constructed two decades ago. In order to improve the performance of HLS, especially getting higher brilliance and increasing the number of straight sections, an upgrade project is started from the end of 2009. This provided an opportunity to reconstruct the server system. The old server system includes several SUN workstations and some rack-mount servers providing file services, net services, database services and development environments, and these computers were all purchased 5 years ago. These years virtualization technology is applied widely, for example, it is applied successfully at CLS[1]. After evaluating the performance and cost, VMware vSphere 4 Enterprise Plus is chosen to build the new server system. Besides file services, net services, database services and development environments, softIOC applications will be also integrated to this new virtualization servers.

HARDWARE AND SOFTWARE SYSTEM

After making the decision to use virtualization technology to construct the server system, VMware vSphere 4 Enterprise Plus is chosen because it is a mature product and used most widely. The products of Dell are chosen to build the hardware platform, which consists of 4 Dell PowerEdge R710 rack servers, 1 Dell PowerEdge R210 rack server and 1 DELL Equallogic PS6000E iSCSI SAN. The figure 1 is the photo of the server system.

The technical specification of Dell PowerEdge R710 is below:

- 2 Quad-core Intel Xeon 2.53GHz processors
- 48GB DDR3 memory

- 64GB SSD
- 8 1Gigabit Ethernet ports



Figure 1: Photo of HLS server system.

The Dell Equallogic PS6000E iSCSI SAN is configured with 16*1TB SATA disk, 8*1Gigabit Ethernet ports, dual power supplies and dual controllers. It runs RAID 6 and has a hot spare drive. The usable disk space is about 11.34TB, as shown in figure 2.

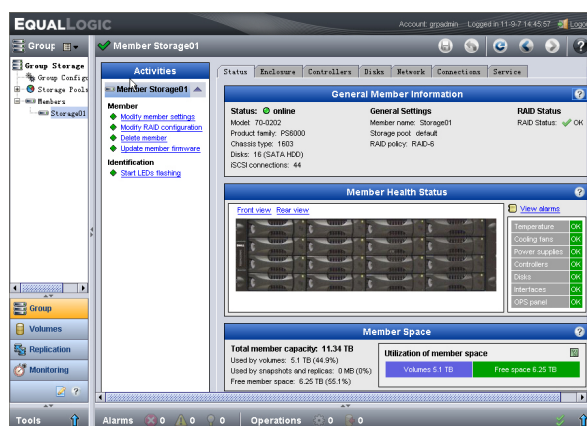


Figure 2: Management interface of Dell EQ iSCSI SAN.

The network topology is very important to the communication performance of server system. 2 switch are adopted, one for storage, the other for product, as shown in figure 3.

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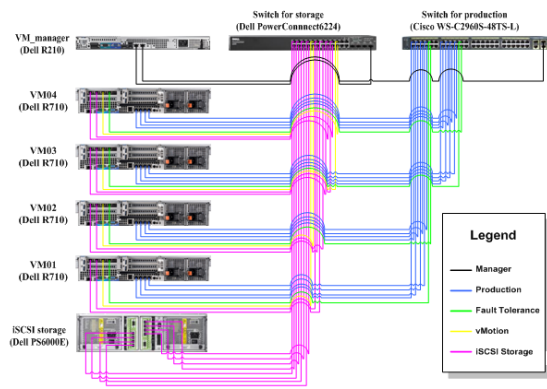


Figure 3: Network topology of HLS server system.

The virtual machine list is shown in figure 4. The virtual machine "Develop_Server" is used as the development environment, which runs CentOS5.5, "Database_Server" runs Oracle10gR2, "File_Server" provides files service and svn repository, "PS_ioc" is the server for softIOc, other virtual machines are for pre-configured templates and operating system tests.

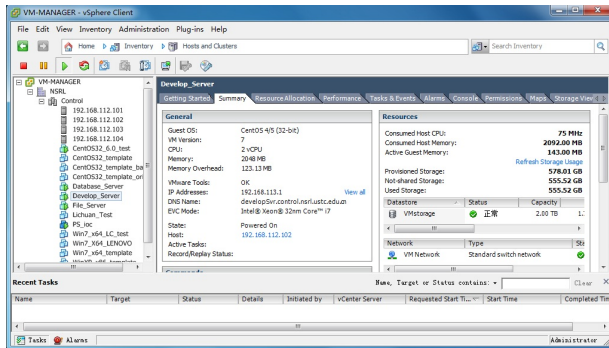


Figure 4: VMware vSphere client.

The following 4 features are related to the availability[2]:

- VMware vMotion. It enables the live migration of running virtual machines from one physical server to another with zero down time, continuous service availability, and complete transaction integrity.
- VMware Storage vMotion. It enables the migration of virtual machine files from one datastore to another without service interruption.
- VMware High Availability(HA). It provides high availability for virtual machines. If a server fails, affected virtual machines are restarted on other production servers that have spare capacity.
- VMware Fault Tolerance. When Fault Tolerance is enabled for a virtual machine, a secondary copy of the original (or primary) virtual machine is created. All actions completed on the primary virtual machine are also applied to the secondary virtual machine. If the primary virtual machine becomes unavailable, the secondary machine becomes active, providing continuous availability.

When VMware vMotion, VMware Storage vMotion and VMware Fault Tolerance are tested on the virtual machine "Develop_Server", the users of

"Develop_Server" are unaware during the virtual machine migration. It looks that the service is continuous. However, VMware High Availability(HA) is related to virtual machine restarting, the service interruption is not ignorable.

THE AVAILABILITY TEST OF SOFTIOc

In order to investigate the availability of softIOc, a test system is setup, as shown in figure 5. A softIOc runs on a virtual machine, it communicates with 2 Agilent 34970A over MOXA serial device server NPort6650. A DAC board is installed on each Agilent 34970A. A SNL program running on the softIOc controls the output of each DAC board, the waveform is triangle with 100ms step and is monitored by the oscilloscope Tektronix DPO4054.

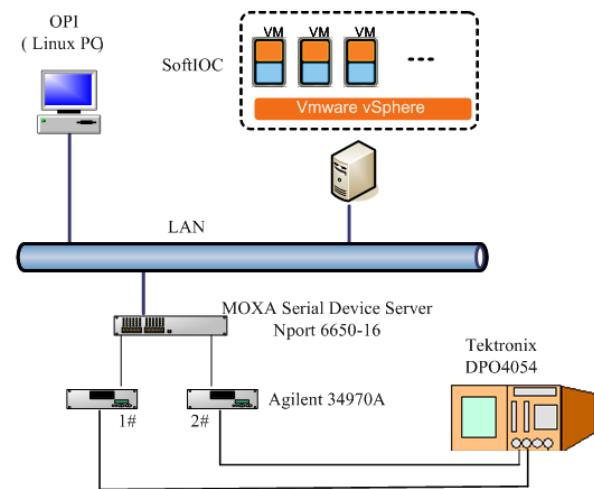


Figure 5: Hardware structure of SoftIOc test system.

The test results for VMware vMotion and VMware Fault Tolerance are shown in figure 6 and figure 7.

The figure 6 is the monitored output waveform during VMware vMotion, the interruption time is about 1600 ms. The figure 7 is the monitored output waveform during VMware Fault Tolerance, the interruption time is about 2600 ms. Although the down time is not zero, it is acceptable in our case.

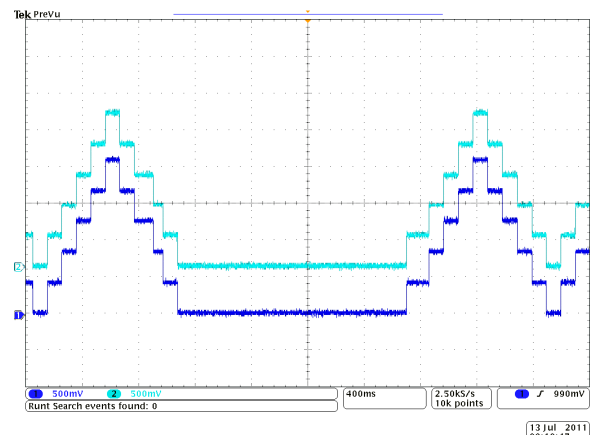


Figure 6: Output waveform during VMware vMotion.

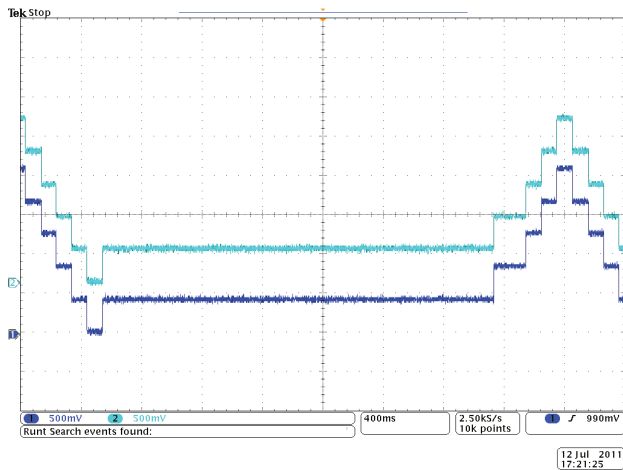


Figure 7: Output waveform during VMware Fault Tolerance.

CONCLUSION

Our first experience with VMware servers shows that the virtual infrastructure can provide a reliable, flexible, extensible and manageable environment. The down time of services during virtual machine migration is not zero, but it is acceptable at HLS. Although VMware vSphere is not cheap, cost per virtual machine will be lower when increasing the number of virtual machines.

REFERENCES

- [1] G.Wright, C. Angel, C. Finlay, et al, "Migration Control Servers and Applications to Virtual Machines", ICALEPCS09, Kobe, Japan, Oct. 2009.
- [2] <http://www.vmware.com>.