Research on the Construction and Application of Backup System under the Environment of Smart Campus

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Abstract

With the further development of digitalization and informationization, the informationization of colleges and universities have entered into the era of smart campus, data security is more and more important, so it is necessary to back up the core data and the key applications. This paper is combined with the actual situations of each system and platform based on the smart campus environment, the importance of the backup system construction is expounded, the requirements of the backup system are analyzed, the construction and application situation of the backup system are introduced, some achievements and experiences are summarized after the completion of the backup system, and hope it will provide references for other colleges and universities.

Keywords

Smart Campus; Backup System; CommVault; Data Protection; Construction.

1. Introduction

Smart campus [1] are smart campus work, study and life integrated environment based on Internet of things, this integrated environment takes various application service systems as the carriers, the teaching, scientific research, management and campus life are fully integrated. The blueprint that the smart campus depicted is: ubiquitous network study, integrated and innovative scientific research, transparent and efficient administrative management, colorful campus culture, convenient campus life. With the rapid popularization of digitization and informatization in our country, many domestic colleges and universities have entered into the era of smart campus; the role of information service is bigger in school teaching, scientific research and management. The elaboration, automation, high efficiency, convenience that school management required also puts forward strict requirements for smart campus. The development of information technology is becoming more and more mature, it has become a virtual working environment in school management, each system and platform carries a number of core businesses of school management, the important data of the school is stored in various information systems in the digital campus, These security of the data presented by electronic form must be highly valued [2]. The raging virus on the network, hackers' destruction, other hardware failure and other factors may lead to data damage or loss, the system operation is affected, bring irreparable damage to school various management business, so it is necessary to consider building an advanced backup system to ensure data security and integrity of critical applications. For the smart campus, it is very important to construct a data protection system that can be popularized in the technology and operated mechanically under the condition of limited technical power, limited financial resources and function in the exploratory stage.

2. Backup System Requirements Analysis under Smart Campus Environment

With the development of informatization construction of Northwest A&F University, the informatization platform has become an important support platform for school teaching, scientific research, management and service. With the completion of the campus cloud platform environment in

2014, the number of server devices and storage devices in the school data center increased further. Important business systems and databases have moved into the cloud platform, data security problem is more important, it is imperative to choose and build a set of backup system with advanced ideas and mature technology,.

Combined with the school server, storage and various application systems condition, through technical advice and survey statistics, construction requirements of backup system have been proposed:

(1) Platform compatibility: support all major operating systems, support all major diskdrives and disklibrary equipment. Backup software server, client must support IBM AIX, Sun Solaris, Windows2003 / 2008 / 2008R2, Linux and so on.

(2) Backup architecture support: backup under the storage area network (SAN) environment should be supported; support LAN-Free backup and Server-Free backup, and support the disaster recovery of backup server.

(3) database application support: require supplying full graphical operation for Oracle, Sybase, DB2, Informix, SQL and other databases, it is not necessary to manually write any script or batch file; in the case of physical backup, require achieving the graphical table-level recovery, the entire database does not need to be restored, and do not need to write any script; dumpTran operation of SQL Server can be monitored, incremental backup after DumpTran operation are automatically changed to full backup, avoid the failure of incremental backup and cannot restore data, requires the backup system can directly view backup and recovery log Oracle, Informix, SQL and other databases, such as RMAN log, without having to log on to the client to check.

(4) Manageability requirements: provide Chinese management interface, all operations must provide convenient and flexible graphical tools to complete the backup, restore, customization, monitoring and other operations, provide convenient and flexible Web and GUI management, the remote management interface can be used to complete the backup, restore, customization, monitoring and other operations.

(5) Reliability requirements: have strong fault-tolerant service functions, when the network or machine fault are repaired, or even after the backup service restart. The original interrupting task can automatically start and continue to run down; the each link of backup system can be detected regularly or before backup, provide pre-inspection report, find various software, hardware, network and system problems as soon as possible, in order to ensure backup system work stably; support breakpoint resume function, graphical interface on the file system and database can be done interruption, continue the backup operation, backup continue from the breakpoint, rather than from start.

(6) Security requirements: should have a user rights administrative module, media password, advanced encryption, auditing and disklibrary functions.

(7) Notification and reporting requirement: provide perfect Chinese reporting system, which can display the information of various task, equipment, media, backup history, etc., and each server, backup data of day/week/month, average performance, the number of success and failure can be generated summarized electronic report, support E-mail, SNMP and other alarm mechanisms.

(8) Requirements for advanced technology: support continuous data protection (CDR), support snapshot backup, support data archiving, support data de-duplication technology, support virtual machine backup and backup data retrieval.

3. Building Condition of Backup System

3.1 Selections of backup system

The building of backup system should be based on the actual situation, long-term planning. Combined with building requirements of school backup system, we inspected CommVault, Symantec

these first class manufacturers of backup system, and selected enterprise product Simpana 10 from CommVault in USA. The outstanding features of this platform include:

(1) Integrated data management model: With the implementation of the cloud platform project, the school has achieved cloud storage, the efficiency and performance of new storage are improved under the cloud storage environment. CommVault simpana10 software can be deployed in the existing cloud storage environment, which can also make maximum use of the original storage devices that do not join the cloud, and make it as a unified storage system to plan, and minimize waste caused by the storage device cannot be upgraded. And greatly reduce the complexity of storage management, by reducing the personnel's' operation and maintenance workload and reduce labor costs, the overall investment costs are reduced. In the future, with the continuous construction of the business mainframe, the data can be effectively protected under the condition that design structure does not change [3].

(2) Intelligent management: CommVault Simpana10 can provide a full graphical user interface to replace a lot of work need to be completed by script originally, so it does not only simplifies the data management, but also improves the reliability of the data. With the increasing pace of informatization construction in school, new application systems continually go online, the need for various hardware devices continue to increase, the technology is more and more complex, these intelligent management relieved problems that only rely on man-made management with high error rate and technical difficulties to a large extent. With intelligent data management, the Simpana software's report management functions can receive hundreds of daily reports from the software, including alarm reports, backup reports, and storage resource reports. And flexibly define it to send to different levels of personnel, so that they first understand the various status of the backup system.

(3) OS-level data protection: CommVault software can back up the operating system, if the unexpected downtime occurred in system or system crashes due to hardware failure, the application will stop running, because the original configuration has no accurate description, which will cause serious consequence to the production system. In this case, Simpana 10 utilizes fast system recovery function to quickly restore the application server to the last backup normal operating condition. This greatly shortens the systematic downtime and improves service level of business continuity for the whole business system.

(4) Protection of the core database: According to the construction requirements of the smart campus, the school establishes the campus core public database, the core application system database and campus card core database, the stored data is very important. In order to ensure the security of these data assets, This requires tools which can focus on key applications and data, CommVault uses RMAN (Database Recovery Manager) to backup/restore it, full graphical "zero" scripting operation can be provided to reduce the database technology and the dependence on the DBA, so that ordinary administrators can easily complete the database backup and recovery work.

3.2 Selections of backup way

CommVault backup software supports two kinds of backup way, including LAN backup way and Lan-Free non-local area network equipment [4]:

LAN backup way achieves the backup through the network transmission to backup device connected by the media server, the advantage is to save investment, disk library share centralized backup management, the disadvantage is big network transmission pressure.

The LAN-Free backup way is based on the storage area network (SAN), which adopts a new architecture, the disk library and the disk array are independent optical fiber nodes, when multiple hosts share the disk backup, the data streams do not pass the network and directly from the disk array to the tape library, the data flow do not take up network bandwidth. The advantage is unified management of data backup, backup speed is high, network transmission pressure is small, tape library resources are shared, and the disadvantage is high investment.

Combined with the actual situation of the school data center, virtual machine backup adopts LAN-free backup way; the other system uses LAN backup way. The majority of backup operations mainly at night in order to reduce network pressure,, which can effectively reduce the impact of backup on system applications.

3.3 Backup system architecture design is shown in Fig. 1:

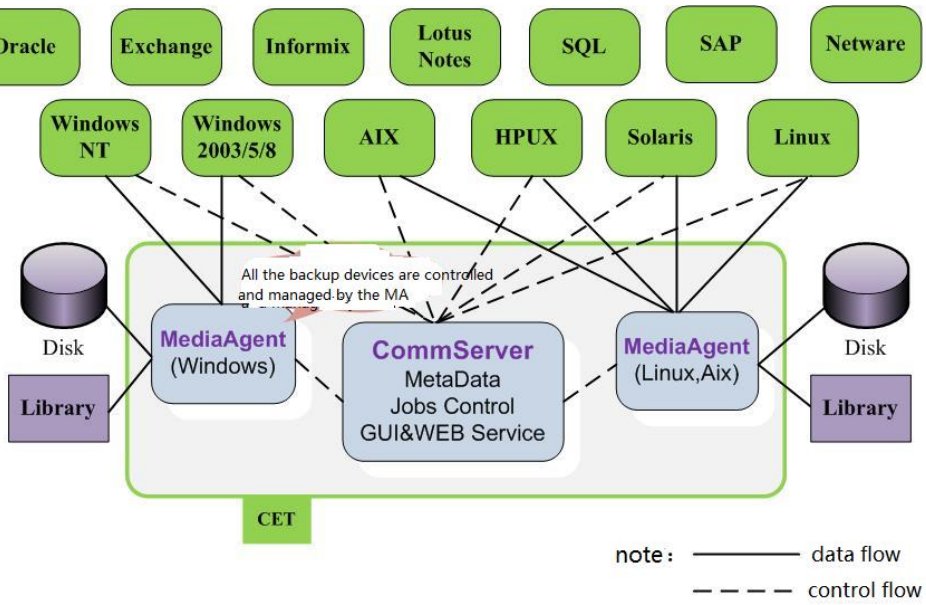

Fig. 1 system architecture of CommVault

3.4 Implementation condition

Windows platform installed and deployed the one CV server and one MA server, one MA server is installed and deployed in the Linux platform, the implemented oracle database nodes are totally six (two single oracle database, a set of oracle RAC mode), MS-SQL database nodes are four, mail system archive node are one, file system backup nodes are ten, one hundred and one VMware virtual machine backup, continuous data replication (CDR) are two sets.

4. Implementation Results

After the CommVault unified data management solutions are implemented, the data backup gets results:

(1) The data recovery time is significantly reduced. Regardless of the file or the database, they are all based on the restore means of Chinese graphical interface, it is not necessary for the administrator to write any script. Users from many administrators completing the recovery operation originally to only one commissioner directly deals with file and database recovery work.

(2) The recovery ways are used to verify the backup data and improve the recoverability of data, application administrators and DBA can restore the data to the verification host, and the business staffs verify the data.

(3) The anti-risk capability is improved. Commvault solution uses a unified strategy to back up application system of all the platforms, the difference among different application systems are eliminated, through the database and file breakpoint transmission and other technical support (such as breakpoint transmission of oracle database backup restore), and the success rate of data protection are improved; backup automatic failure restart mechanism strengthen the systematic anti-risk ability.

(4) The pressure on the management and costs are reduced. One backup administrator can realize the unified backup management of application system; the software management side only needs to use the PC server, without having to buy expensive hardware.

(5) The management is simplified; data processing process is standard and evidence-based.

(6) The convenient data exchange is achieved.

After a period of operation, this backup system is proved to be simple operation, the backup strategy is reasonable, the operation is safe, stable and reliable, after testing, the provided function does not only avoid the loss of important data caused by various factors, but also greatly reduced the impact that the data recovery time bring important system outages, played the second lifeline of the role of education informatization, but also eliminates the previous the time and human input by manual backup, the management are more scientific and reasonable , SAN architecture uses a multi-link and dual redundant way, which provides a high reliability and good I/O performance for the operation of the application database, the running stability of the database system are ensured and the desired results are fully achieved.

5. Conclusion

The backup system construction can not only focus on immediate needs, which should add some hardware and software margin for future possible systems and applications, backup system construction should try to reflect the applicability, stability, easy maintenance and other characte-ristics [5]. After the establishment of the backup system, more work is to check whether operation of the system is normal, backup logs are abnormal phenomena or not. The effective running of backup system must ensure the establishment of media management system with related rules and system, the checked contents of backup system are added in tie daily inspection system, the training work of backup system should be attached importance to, first, arrange personnel comprehensively to study backup system, if necessary, recovery drill server are added to carry out recovery tests and recovery of temporary logic error. Through the implementation of the backup system, it can ensure the availability and reliability of the digital campus application system and enhance the data security of the cloud platform; this backup system provides a solid foundation for the application and popularization of the campus cloud platform.

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