A Research of Information Management System Solution Base on Centos & Oracle

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Abstract-**With the rapid and exciting development, a lot of open source software have been applied in various fields and evaluated very well. How to take advantage of open source to structure large scale information management systems for reducing the cost of application developments has become a meaningful research. This paper is focused on CentOS and Ubuntu Server, both falling into open source Linux operation systems, and proposed a method for developing large scale information management system based on them using B/S three-tier structure. Furthermore, in order to verify the applicability of the method under various Web.2.0 standard applications, a testing system with a massive data named Alumni Information Management System has been deployed. This paper, not only verifies the effectiveness of the approach of CentOS and Oracle for large scale information management system, but also discusses the puzzles in the development. This paper gives a technical reference for the other similar projects to improve the utilization of open source software.**

Keywords: **large scale information management system, Oracle, CentOS, open source.**

1. Introduction

Governments tend to use Linux for its safety and low cost. For example, Japanese government asked the Public Management Institution, Interior Department, Post and Communication Office to organize an expert team for the research that how to replace Windows by Linux, in the financial year, April, 2004. Korea also establishes policy for open source software with the highlight of Linux severs and embedded software. Moreover, Spain, Germany, France, Italy, Finch and Britain, established nearly 70 mandatory or encouraging policies to select open source software in their government procurement. In 2003, there are almost 500 government departments cooperated with IBM to promote the usage of open source [1]. Meanwhile, recent years, the application of Linux has been paid more and more attention in China. In 2005, 40 colleges were approved to establish Linux training and promotion centers. In the FLOSS report, there are four motivations of governments to exploit open source: Independent, cost, safety and transparency consideration.

At present, in terms of database server, utility system constructed by Linux and Oracle is very popular, since Oracle occupies a biggest market share and Linux occupy the highest annual rate of growth [2]. For instance, Oracle and Linux took 80.5% market share in 2004, and 69% in 2003. Meanwhile, in the rapid increasing market of Linux, the growth rate of revenue of Oracle reaches is 155%. Since it took almost 80% market share, Oracle has become the best database management system on Linux platform. Furthermore, cluster database application system based on Low-cost Linux sever supplied the capability, elasticity and reliability that many enterprises nowadays seek for.

With the development of agricultural informationization, more and more large scale information management systems are needed to accelerate the development [3]. However, among the strategies of Linux and Oracle adopted in the commercial management system, Red Hat Enterprise Linux, whose price is very high will not only increase the cost, but also block the development of agricultural informationization. Therefore, this paper put its purpose on finding out a well-performance and low cost solution for large scale information-management system based on CentOS and Oracle.

2. Material and method studied

2.1 Advantages of CentOS5.3

Community Enterprise Operating System (CentOS) is a product of RHEL (Red Hat Enterprise Linux) recompilation by some Red Hat rebuilders after the announcement of no free technical supports and product certifications by Red Hat Company in 2003 [4] .

CentOS5.3 is a kind of Linux which is compiled based on Red Hat AS5update3. Besides network functions, safety, portability and openness, the key advantages of CentOS over other server-type distributions, apart from its free nature (as in both speech and beer), is its rock-solid reliability and the long lifecycle of the product [5]. Meanwhile, it can be used for large scale systems to meet the enterprise-level demands with strong capabilities.

2.2 Advantages of Oracle11g

Oracle11g issued by Oracle Company is a database management system which supports Grid computing. Nowadays, Oracle is one of the most popular database management systems with the features listed as follows:

(1) An architecture based on the sharing of SQL and multi-thread server.

(2) Role-based security management.

(3) Support of multimedia data, such as binary image, audio, animation and multidimensional data structures.

(4) PRO* interface software with 3G, the third generation high level language.

(5) Distributed database.

The above features guarantee the storage of various types of massive data in the large scale system and benefit the management, utilization and mining of those massive data in the process of informationization.

2.3 Implementation of applications based on CentOS and Oracle

The solution of large scale information management system implementation based on CenOS and Oracle means providing a developing environment using B/S structure. And under this environment, large scale information management system can be operated by Oracle database server and Web technique such as PHP 、 Ruby 、 Python and JavaEE. Through the analysis of CentOS, it can be known that CentOS has the advantages of stability, security and even free. Thus it has remarkable value that CentOS cooperated with Oracle for building enterprise-level solution of large scale information management system.

(1) Construction of developing environment

CentOS5.3 which has few requirements of hardware environment was installed on the application server in this paper. Furthermore, the structured application is focused on the large scale information management system and doesn't need graphical interfaces. Therefore, it only needs to install a proper environment and Windows operating system. Other necessary software packages will be installed when the Oracle installation package was checking.

(2) Construction of application system

Oracle Company has issued Oracle11g Linux version. However, only Red Hat Enterprise Linux, SUSE Enterprise Linux and Asianux have been supported by Oracle Database 11g. It is hard to install Oracle 11g on Linux which are not accredited. This paper studies on installation-script, start-script and operations of Oracle11g when it worked on Red Hat Enterprise Linux operating system and tries to figure out the possibility of installing and running Oracle on CentOS after configurations.

Setting kernel parameter as follows:

```
kernel.shmmax = 536870912  #defining the biggest size
of shared memory segment
kernel.shmmni = 4096       #used for setup the amount
of shared memory segment confined in setting system
kernel.shmall = 2097152    #expressing the gross of
shared memory segment once use (page units)
kernel.sem = 250 32000 100 128  #setting the quantity
of signal of semmsl, semmns, semopm, semmni
net.core.rmem_default = 4194304  #defaulting the size
of windows
net.core.rmem_max = 4194304  #permitting the biggest
measure of receipt windows
net.core.wmem_default = 262144  #defaulting the size of
the TCP sending windows
net.core.wmem_max = 262144    #permitting the bigger
measure od TCP sending windows
fs.file-max = 6553600             #expressing the biggest
quantity of file handle
    net.ipv4.ip_local_port_range = 1024 65000
```

Installing necessary software packages, such as: gcc, make, binutils, setarch, compat-db, compat-gcc, compat-gcc-c++, compat-libstdc++, compat-libstdc++-devel, unixODBC, unixODBC-devel, libaio-devel, sysstat. All the above solve the problems of dependent occurred in installation of Oracle11g, to ensure the successful installation of Oracle 11g on CentOS5.3.

Setting the environment variables listed as follows:

```
ORACLE_BASE=/aisora/app/oracle #installing path
ORACLE_HOME=$ORACLE_BASE/product/11.1.0.6
ORACLE_SID=AISDb
PATH=$PATH:$ORACLE_HOME/bin:$ORACLE_H
OME/Apache/Apache/bin
TNS_ADMIN=$ORACLE_HOME/network/admin
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:ORAC
LE_HOME/lib
NLS_LANG=AMERICAN_AMERICA.ZHS16GBK
ORA_NLS10=$ORACLE_HOME/nls/data
```

Adding user groups and users as follows:

```
#groupadd dba            #setting the necessary list dba
of installing Oracle11g.
#groupadd oinstall              #setting the user list of
installing Oracle11g.
#useradd oracle -g oinstall -G dba   #setting a user, using
this user to installing Oracle
#passwd oracle                  #setting the private
information of this user
#chown   –R    oracle:oinstall    /home/oracle/database
#correcting the belonging of this file to make sure the
installation
#mkdir -p /aisora              #building the catalogue of
installing Oracle11g.
#chown -R oracle:dba /aisora        #modifing the belonging
users and user list
#chmod -R 755 /aisora         # modifing the catalogue
```

After configurations, the Oracle 11g environment is ready for users. In this paper, it is successfully installed Oracle11g Enterprise Edition on CentOS by using the local terminal of Xserver. In this way, an environment of application system based on Oracle and CentOS has been established.

After the application system has been built, the system server and data server was constructed. The next step is to install Web server Tomcat6.0.20, and start it. Thus the solution of a B/S structure large scale information management system has been finished.

3. An example of large scale information management system

In order to prove the stability, storage capability and concurrency of the established system, this paper deployed a large scale information management system based on JavaEE under the environment of CentOS and Orcale 11g which was already established. Layered architecture and MVC (Model-View-Control) mode were adopted to develop this system.

The architecture of this system is working with five layers—Custom Layer, Web Layer, Model Layer, Durable Layer and Data Layer. This reduces the coupling among parts of system which is convenient for the distribution of development and enhances the maintainability and extendibility [6]. The descriptions of each layer are listed as follows:

(1) Custom Layer: is achieved by JSP、JSTL、Ajax and JavaScript and is a user-oriented layer based on Web application. Responsibilities: responding the customer request; supplying a controller to allocate request to other layers, providing service model data for display, and proving inputting content from UI interface.

(2) Web Layer: only has the necessary control logic. Responsibilities: achieving safe visitation to Web resources, coding uniformly, accepting request and giving responds according to data or status achieved from Model Layer.

(3) Model Layer: Java Class of this layer is composed of business objects for actual demand, such as users, products and so on. Responsibilities: performing the object-oriented of related objects, transferring data between different layers, achieving coarse particle transfer and enhance the performance of the system, supplying data resources to Custom Layer and persistent objects to Durable Layer.

(4) Durable Layer: is the final part of Web application server which cooperated with database directly. Responsibilities: establishing the relationship between persistent objects and their attributes, tables and fields of database, providing briefly mechanism of SQL statements, implementing CRUD manipulation of data (such as creating, reading, upgrading and deleting), building and managing connection of database. This layer also operates on database and makes the persistent data into Oracle database.

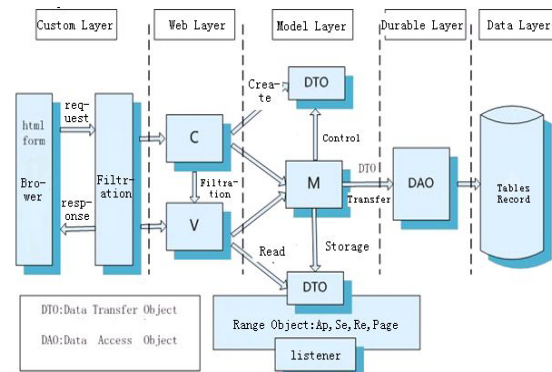(5) Data layer: is the record of Oracle database tables.

Figure.1: Layered architecture and MVC mode.

Using layered architecture to build large scale information management system[7], it has been proved that the performance of the platform of CentOS and Oracle is effective and satisfies the demand of massive data . What's more, the architecture discussed in this paper has clear structure and high expansibility. Meanwhile, other information management systems also could get satisfied performance on this platform.

4. Discussion

Ubuntu Server 8.04 is a kind of server with long term support and more business functions released by Canonical Company, the business supporter of Ubuntu in April, 24, 2004. Ubuntu Server 8.04, as an enterprise operating system supports virtualization, enhances the efficiency of integration and has already obtained the hardware collocation authenticate by Sun. Therefore, the free Ubuntu Server 8.04 has become one of considerations to reduce the cost of IT development which has been the first try that operated on Oracle database in this paper.

There are three methods to install Oracle on Linux which has not been approved by Oracle: configuring Red Hat Enterprise Linux, SUSE Enterprise Linux and Asianux. Hence, Oracle database management system could be installed and run. However, the above methods have limitation that operating systems could not be improved in code level. And the following problems are that Oracle could not run across the operating systems with many differences.

This paper configured Ubuntu Server 8.04 referring to Red Hat Enterprise Linux. In this way, Oracle views the environment as Red Hat Enterprise Linux. Since various Linux systems have the same open source code, Oracle could be installed on Ubuntu with less mistakes. In addition, because of the difference of open source redevelopment, Oracle database management system could not run completely on Ubuntu.

Failure of building applications using Ubuntu and Oracle makes CentOS5.3, is selected to implement large scale information management system, which is similar to Red Hat Linux and is supported by Oracle. It has been proved that less time and energy for development on the platform of CentOS5.3 and Oracle 11g is needed than other open source Linux [7]. Meanwhile, it provides characters of stability and capability requested by large scale information management system. After testing, this platform is proved to be working well.

5. Conclusion

This paper proved the feasibility of the strategy applied in large scale information management systems using CentOS [9] and Oracles. The conclusions are given as follows:

(1) It is stable and safe to develop large scale information management systems on the platform of CentOS and Oracle.

(2) The solution proposed in this paper can be used to develop most information management systems base on Oracle database, no matter they are developed by PHP, J2EE, Ruby or Python based on B/S structure.

(3) The features of free, public, and open make open source [10] software has a wide applications in the future.

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