



Virtualization of Data Base Layer (VDBL)

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ABSTRACT

• In between 1950's and 1960's the virtualization came into existence in the computer "time sharing" practices [2]. This emerged due to expansive technology in the distributed environment. Dividing the resources among many users was developed because assigning a computer system to a single user was practically not possible. Executing Programming required a combination of hardware with software to delegate the receiving attention of user from the central processing unit at a particular time (Popell, 1966) [3]. This process can be compared similar to today's virtualization (in it a layer of abstraction is created to logically assign the use of a computer asset).

KEYWORDS

- Virtualisation
- DataBase

Introduction

Managing resources on server had been most challenging during last few years due to the need for interoperability and flexibility increase and heavy investment in computing hardware. The push for universal acceptance on computing has begun. As a result, managing server resources has become extremely challenging. To adapt the virtualized environments there is a need of the improved deployment, flexibility and relocation of oracle database instances on servers[1]. Virtualization has changed totally the way of running information systems through the permission of flexibility of hardware and software for the industry. Timely expansion of the resources of mostly available servers, the optimal utilization must be enabled without problems. IT infrastructures are needed to improve manageability and ownership cost reductions at all levels. The enterprises will be empowered to adapt rapidly to business demands. Clearly the database servers will run havoc inside the virtual machines in such environments. This raises the question of improved capabilities of database systems. This paper proposes the concept of transparent relocation of database instances on servers by virtualization of the Database layer.

Related Work:

IBM in 1967 released the IBM\360 version 67, using virtual memory concepts first time (a method in which disk space is used to expand the RAM size of a machine).

In the 1970s, the "virtual machine" came into existence. In it the software with hardware could be brought in a contained environment. The virtual machine is perhaps the first form of virtualization.

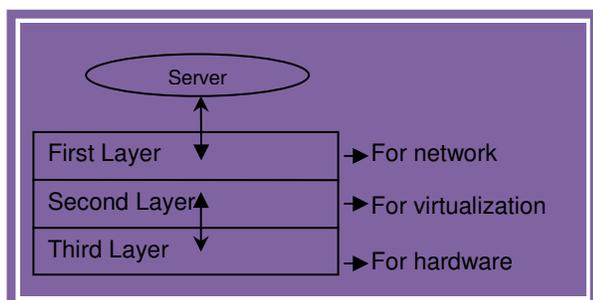
In 1980's and 1990's the cleaning work from the patch work client server systems started scrambling. The IT administrators pushed the world to the "universal computing". The need for interoperability and flexibility increased work in this direction. Grid computing, "plug-and-play" or "blade" server farms, storage devices[4] attached to network and many more supporting the adaptable technologies made breakthroughs in distributed processing.

This changed the way of information system running by the rise of virtualization into new model. Which allowed the software and hardware flexibility; IT industry never seen before. The industry was empowered with systems to adapt the business demands which new opportunities. It will improve a capability in today's commercial world [5].

Intel released "Vanderpool" technology and AMD's "Pacifia" technology. These provide hardware native server virtualization functionality. This proceeded more step towards the concept of virtualization with a high-impact practice in the industry.

Difficulties with the Database Servers

Database Servers are not fully monitored in all phases regardless of the operating system being used. For DBA, who is responsible to maintain each server, the database servers are bonus, but for the management they may be challenging.



Server Virtualization

An oracle instance lies on a single server with duplicate work and utilizes RAM and CPU resources; this is a problem for the Oracle DBAs in their tight schedule moving databases. There is also a problem of virtualization design which can be defined as: "A number of databases workloads running on a number of database systems residing in virtual machine, to get the best performance in all how should we establish the resources with adjustments to a number of virtual machines".

In any enterprise which is quite large having number of hardware resources and data centers, mostly over allocated to accommodate with processing loads. This increases the expansiveness and wastefulness of the resources for the enterprises. The ultimate result comes in the form of consumption of time, because as the database is moved from older to

new server; the migration becomes the overhead for the DBAs.

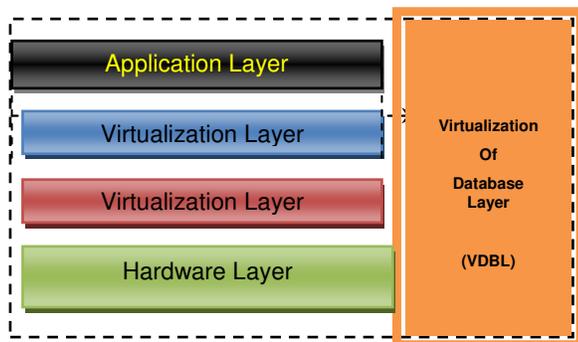
Current challenges are the performances (depending on application profiles), though the performances can be limited in particular by simultaneous virtual address translation for many Virtual Machines in few architectures. The unauthorized Operating Systems' access is difficult to handle from the point of view of real memory. Intel Virtual Technology resolves these problems in the new extensions to IA instruction set (Intel VT) , and makes easier to increase server utilization in data center ,improving reliability and robustness to virtualized systems by consolidating more and more applications.

The hardware infrastructure is the main virtualization strategy as been discussed; the important and overlooked method is the application virtualization of database, which is some times referred to as *service visualization*. In a network the end user software is distributed and packaged with application virtualization [6]. This goes with standardized web services initiative creating sensation in the IT sector all over the world.

There is a requirement of virtualized database application layer using common abstraction layer which may communicate in a standard messaging format and may define a protocol. The Virtualization of DataBase Layer (VDBL) is not only capable of invoking requests but also confirming the application's state and availability of remaining data on all resources (Data Synapse 2005).

The Solution

The enterprises can add and remove application servers ensuring computing resources to match the load of the end user. This theme gives birth to virtualization of database.



The author viewed an advanced large tiered (4-tier) system architecture which easily enhanced computing resources at the application server levels at web server.

DBMS run at only one server at single time span. Databases are removed between servers in the complex parallel architectures like Oracle’s Real Application Clusters. This may lead to a wastefulness situation of huge amounts on computer resources due to the balancing problem of server load at the database level.

In data mining and data warehousing systems database virtualization allows the use of multiple instances of a DBMS, or different DBMS platforms in a transparent way regardless of their physical location.

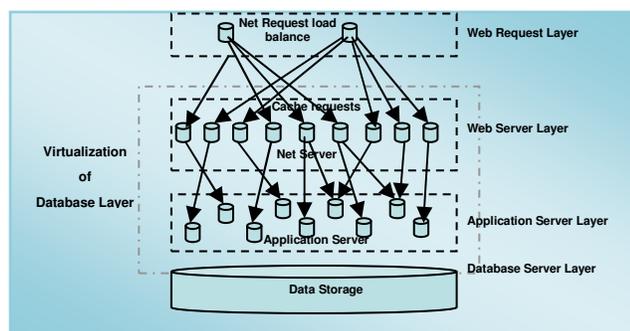


Figure 1: Virtualization of DataBase Layer(VDBL).

By the coming of Storage Area Networks (SAN) technology, it is easy to move disk storage from server to server, allowing dynamic relocation of disk storage according to needs. Though SAN is much successful for storage relocation, even the database layer remains a problem. Server virtualization enables multiple virtual operating systems to run on

a single physical machine, yet remain logically distinct with consistent hardware profiles (Burry & Nelson, 2004) [7].

In context to sever virtualization ,to increase the return on investment the efficiency of server hardware should be maximized .Often server virtualization take the place of the manual server consolidation, by combining many physical servers into one logical server. "The idea is to present the illusion of one huge machine that's infinitely powerful, reliable, robust and manageable - whether it's one machine that looks like many, or multiple machines tied together to look like a single system" (Brandel, 2004) [8] .

With the exception of complex parallel architectures such as Oracle’s Real Application Clusters, database management systems can generally run on only one server at a time, and databases must be moved between servers manually. This limitation has led to a situation in which huge amounts of computer resources are wasted because of the difficulty of balancing server load at the database level.

The concept of Database Area Network(DAN) has tried to resolve this issue. In it a database switch is used with Storage Area Network allowing databases to move from one server to another server without updating their availability.

Virtualization of DataBase Layer(VDBL) increases the flexibility through the proposed architecture. The database switch having high speed placed between the application layer and database layer enables databases for transparently located again on new servers without applications modifications. The databases servers should be connected to the shared storage so that database files are again mapped on other server.

Linux server runs the DataBase Switch software which communicates with agents loaded on each managed database server to get information in real time. The DataBase Switch maintains a database performance and availability information. The database applications connect to off-the shelf Cisco router, which connects it to the appropriate database with the help of Network Address Translation (NAT) and Port Address Translation (PAT). The switch automatically controls the application connections with database server. For this the databases must be Oracle (8i / 9i) using SAN.

Every database can be identified by the unique **Virtual IP address** which is not defined on any particular machine on the distributed architecture. The database switch (using Network Translation) routes these **Virtual IP addresses**. This allows DBMS instances to move without any effect on application server layer. The database servers have complex load balancing. Enterprises force the end users to accept the unacceptable response times due to lack of knowledge and visibility in database resource utilization requirements; doing so they over allocate database server resources and expend in waste millions and millions every year.

Data Area Network techniques allow for the relocation in runtime of database instances which match server processing capacity to database resource needs. Virtualization of DataBase Layer (VDBL) technique provides seamless connectivity to a virtual database. VDBL requires Data Area Network and SAN to utilize existing database resources providing higher availability and scalability to the applications.

Benefits –

As discussed database versions 8i or 9i and server platforms like Linux, Solaris, the virtualization techniques-

1. Database access is done in applications without server awareness residing (concept to database virtualization).
2. Virtualization may relocate immediately the database to some other server in case if server fails.
3. Seamless addition of database servers for the upgraded performance without interrupting the service.
4. Immense expenses against hardware, software, and administration are reduced.
5. Return on Investment (ROI) can be affected.
6. This concept helps in controlling all database servers with quick relocation of database instances.
7. Security benefit by virtualization related to disaster recovery is very helpful[5]. The lost server can be restored on a machine with unlike hardware configurations as virtualization layer separates the hardware from the operating system environment.
8. For high availability and disaster recovery backups from several servers to one secondary server backups can be performed with less expense.

The Impact

Non figurative layers inserted in between hardware and software components may increase the control on these by multiplying computer assets. The Virtualization of DataBase Layer (VDBL) permits the manipulation of the assets logically. Hence this paper will define Virtualization of DataBase Layer (VDBL)s the process of applying a software layer of abstraction in between various computing resources separated logically.

Security is increased in virtualized layer of database because hackers are not familiar with the complexity configuration of the system. This is due to the reason that virtual applications run on multiple servers. This prevents the hackers from determining the physical resource (Lindstrom,2004). According to Yager (2004) [9], the virtual machines emulate hardware systems create confusion for the hackers to crack a system that doesn't exist. With VDBL tools through new infrastructure the demand for increased database capabilities can be get solved easily at a task.

This type of system has much more inherent capability on optimization of the use of resources than alone SAN or DAN. Any element of VDBL can be leveraged completely with virtualization resulting switching costs are lowered to flexibly implement and install more efficiently. The applications can be separated completely from both the applications itself and the hardware. It may check the complications.

Management in Run-time

Database usage patterns using intelligent algorithms are established over time with the virtualization feature. Analyzing the resource consumption history Virtualization of DataBase Layer (VDBL) prevents a slow down taking actions in problems and bottlenecks. The DBA gets recommendations and visibility for a last decision as VDBL is Decision Support System (DSS) technology. The right level of utilization is established with the combination of instance relocation and optimization of resources. VDBL drastically saves software/hardware costs. Virtualization of DataBase Layer (VDBL) may soon be a standard layer of the infrastructure stack (Mitchell, 2005) [10] as virtualization technology costs are decreasing. Hardware manufacturers as AMD, Intel and others have started built-in virtualization functionality in their systems. From all

type of enterprises may start soon getting their success path in Virtualization of DataBase Layer (VDBL). Products like Oracle's Transparent Application Failover (TAF) permits instance relocation to be performed to move to another server [11]. It is transparent to the database clients [12].

Conclusion

Using Virtualization of DataBase Layer (VDBL) makes intelligent relocation decisions [13], allow management and DBA to consolidate servers declining costs in software/hardware. The VDBL consists of highly effective performance unchallenged in providing adaptability with boosting growth to the organization by reducing costs as well. IT managers from all kind of enterprises and corporate may soon start following the path of VDBL due to indulging of virtualization in standard form. There is no match to VDBL effectiveness. Relocation can be done with pressing a button, on adding VDBL, and that's too within seconds without breaking sessions of user or losing transactions on database servers. Virtualization is in its beginning stage of development, though many companies are researching in this field.

This is the new technology merging the concepts of DAN and SAN; so it will be much creative to adapt VDBL to get database server consolidation with resource optimization. Usage of storage device can be manipulated with high availability of resources. On occurrence of a problem, the DBA can perform a rollback quickly and easily to work. The removal/addition is also managed with VDBL tools. Implementing virtualization to database layer provides similar benefits as to implementing DAN which I discussed earlier requires a SAN, including the ability to utilize database resources making availability and scalability to the applications to use. This is the golden rule for VDBL and other Virtualization products to improve the maximum utilization of existing resources increasing the Return of IT investments.

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