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Management of pooled resources is the most immediate requirement for building private clouds.
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FEATURE

**Heterogeneous Virtualization Management on Critical Path to Cloud Computing**

IDEAS reviews approaches to heterogeneous virtualization management from Microsoft, IBM, and Univa UD.

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## Oracle's Sun Database Machine Banks on Flash Cache for OLTP and Data Warehousing

*Joseph Zhou, Senior Analyst*

Betting that its acquisition of Sun will clear regulatory hurdles, Oracle's new Database Machine Version 2 employs Sun hardware, replacing the HP systems of the initial product. The upgrade to Nehalem Xeon processors certainly enhances performance, but a big performance boost results from the use of vast amounts of Sun FlashFire flash memory. Oracle terms the outcome as "the first Database Machine for OLTP."

### The Evolution of the Oracle Database Machine

The latest Oracle Database Machine v2 presents an intriguing integrated platform comprised of both server and storage resources, optimized for the distributed database architecture of Oracle Real Application Clusters (Oracle RAC).

The secret sauce of Oracle Database Machine's strong performance is the Oracle Exadata Storage Server software, running on the storage nodes of the Database Machine rack complex. Similar to mainframes, which rely on the Parallel Access Volume (PAV) support in the storage array to harness optimal performance, the Exadata Storage Servers provide a high-performance software stack and storage grid that allows massively parallel data access from the Oracle RAC server cluster.

The first generation of Oracle Exadata Storage Server and Database Machine was implemented on HP ProLiant server hardware, specifically employing eight HP DL360 G5s as compute servers and fourteen HP DL180 G5s as storage servers. The new Sun Oracle Database Machine switches to eight Sun X4170 compute servers and fourteen Sun X4275 storage servers. The jump from Xeon 5400 (Harpertown) in the HP edition to Xeon 5500 (Nehalem) in the new Sun version understandably yields substantial performance benefits, with Oracle claiming 80% faster processors and 200% faster memory, as well as faster disk throughput and networking. Although some might relate this switch to the pending Sun/Oracle merger – it is clear that Nehalem offers substantial improvements over prior Xeon servers.

The Sun hardware deployed in this solution is not merely a commodity server. On top of the Nehalem processors, 24 GB memory, and industry-standard I/O subsystems, the Sun X4275 offers four Sun FlashFire cards (aka Sun Flash Accelerator PCIe Cards) each with 96 GB of Exadata Smart Flash Cache. A maximum of fourteen Exadata Storage Servers in a rack totals 336 GB of RAM and over 5 TB of flash memory (PCI-based Solid State Storage). The Oracle Exadata software has the intelligence to host frequently accessed database tables or even entire databases within memory and flash memory. The Oracle Exadata software, as a storage application, favors servers that offer large Solid State Storage (SSS) footprints. Currently, the Sun Fire server with FlashFire PCI-flash cards stands out as an ideal hardware platform to quench the memory thirst of the Oracle Exadata software.

### The Flash Effect

The significant performance gains that can be realized from SSS acceleration have been demonstrated by a number of exceptional benchmark results from SSS vendors such as Texas Memory Systems. There is no doubt that a storage grid with over 300 GB of RAM and over 5 TB of flash memory, connected by 40 Gb/s InfiniBand switches, can satisfy the data I/O requirements of the eight Oracle RAC server nodes in the same Oracle Database Machine complex.

The huge amount of SSS in the Sun Database Machine permits large databases to reside in memory, for blazing fast performance. Furthermore, Oracle claims that its Exadata compression typically attains 10 to 15x, even up to 50x, compression ratios that allow even very large databases to fully reside in flash and DRAM. Thanks to that capability to host large in-memory databases, Oracle predicts that the Sun Oracle Database Machine will offer outstanding OLTP capabilities in addition to superior Data Warehousing performance.

### The IDEAS Bottom Line

Despite its impressive performance, the Oracle Database Machine is not for every customer. Because today's network storage arrays also provide excellent performance for mixed workloads (including Oracle database applications) the business case for deploying a specialized platform to run Oracle must be material. In addition, the business case must cover substantial opportunity costs to justify the considerable investment in an Oracle Data Machine. For example, the business case might need to prove that a lower-performing system would result in an unacceptable loss of productivity. Oracle CEO Larry Ellison, in his webcast, revealed some price indications. However, these were just for hardware costs. The Oracle Exadata Storage Server software is also chargeable, on a per-hard-drive basis (up to 168 hard drives per rack). The software licensing and support costs may more than double the total system cost (from the base prices provided in the webcast). In that price range, the Oracle Database Machine should be pitted against integrated solution delivery services from system vendors or integrators, rather than positioned as a storage alternative to traditional storage platforms. The solution cost of an Oracle

*(Continued on page 5)*

## Heterogeneous Virtualization Management on Critical Path to Cloud Computing

*Tony Iams, SVP and Senior Analyst*

IT managers are currently preoccupied with two global trends affecting the industry: 1) adopting virtualization at multiple levels of infrastructure, including servers, network, and storage; and 2) reducing operational costs through improved processes and tools for managing higher-level services and workloads. The cloud computing concept is generating considerable interest in part because it touches on both concerns. From a business standpoint, cloud computing promises to convert IT costs from capital expenditures to operational expenditures. Traditionally, the process of acquiring IT resources has involved significant capital expenditure cycles, which risked waste and/or customer dissatisfaction if they were not aligned with workload demands. With cloud computing, users hope to alleviate that risk by tapping into computing resources from third parties on demand, rather than repeatedly confronting the challenge of accurately predicting their requirements and provisioning for them. In this way, cloud computing may help administrators deliver necessary service levels, while avoiding the inflexible costs associated with traditional infrastructure.

With the rise of third-party cloud computing services such as Amazon EC2, some smaller companies may now be able to take advantage of outside cloud services, or applications hosted in Software as a Service (SaaS) offerings, for key computing functions. But for most mid-sized and large enterprise companies, deploying production workloads on third-party cloud services is still a distant reality – one that will materialize gradually over time. Right now, these users are concerned primarily with planning a future transition to public cloud infrastructures, while they adopt virtual infrastructure inside their organizations to create "private clouds." The transition to external cloud computing resources will happen incrementally: first for "cloud bursting," – in which workload spikes are absorbed by temporarily taking on third-party computing resources – and then for selective re-hosting of non-critical workloads with third-parties.

A critical step in this process is choosing a virtualization management platform that can help to bridge the organizational and technology silos that currently prevail in many customer infrastructures. Such a platform should span servers, storage, networks, and virtualization platforms, and ultimately offer pathways to external cloud resources. Several recent developments present solutions in response to the growing importance of managing infrastructure based on heterogeneous virtualization platforms.

### Microsoft Steps Up to Virtualization Management Challenge with Hyper-V 2008 R2

Microsoft has shipped Hyper-V Server 2008 R2, a new version of its virtual machine hypervisor. Hyper-V Server 2008 R2 introduces some critical new capabilities, including Live Migration (i.e., the ability to move virtual machines from one host to another without interrupting their processing) and Cluster Shared Volumes (CSV), a cluster file system for keeping virtual machine storage consistent across multiple hosts. Microsoft has offered virtualization management tools for some time, including System Center Virtual Machine Manager (VMM). However, the full potential of VMM is only now being unlocked through the live migration capabilities in Hyper-V Server 2008 R2. When deployed with Hyper-V Server 2008 R2, a key strength of VMM is its ability to take full advantage of the output from Physical Resource Optimization (PRO) Packs. PRO Packs allow hardware components to communicate data about their operations to System Center Operations Manager. As particular conditions arise in the hardware layer of systems, System Center can respond by automatically triggering actions in VMM to reconfigure the virtual layer of systems.

For example, servers can report power consumption by processors via PRO Packs to System Center Operations Manager, which could set a policy that limits the total power consumption per server. If that limit is exceeded, System Center Operations Manager could instruct VMM to perform a Live Migration of virtual machines to other hosts that are not drawing as much power. In another scenario, if a Host Bus Adapter (HBA) becomes congested, the PRO Pack from a network peripheral provider could alert System Center Operations Manager that virtual machines should be dynamically relocated to another host with less congestion. In both of these cases, VMM is reconfiguring virtual infrastructure in response to conditions in physical infrastructure, without disrupting the virtualized workloads. As a result, Microsoft's virtualization management platform can be used to dynamically reconfigure virtual machines in response to conditions in both hardware and software, providing administrators with insight and control over the behavior of virtualized workloads on an end-to-end basis.

Another advantage of VMM is that it can be used to manage both Hyper-V

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and VMware ESX. VMM has the ability to initiate virtual machine transfers on either platform, allowing administrators to define resource management policies for reconfiguring virtual infrastructure independently of the virtualization platform on which the infrastructure is hosted. As a result, administrators do not have to work with different management consoles for each virtualization platform (VMware's systems management framework, vCenter Server, still has to be installed though, in order for VMM to control VMware-based virtual machines).

### IBM Standardizes Virtualization Management for Its Systems Portfolio

IBM recently introduced a new virtual machine management tool called VMControl, an extension to its Systems Director server management platform that can be used to manage multiple virtualization platforms from the same interface. VMControl is designed to run on all of IBM's hardware platforms, including System x, Power Systems, and System z, and it is available in different versions. The most basic, VMControl Express Edition, can be used to create, modify, and delete virtual machines, or trigger the live migration of VMs from one host to another. An extension called VMControl Standard Edition, due for shipment by the end of the year, will add more powerful functions for performing virtual machine relocation; importing, editing, creating, and deleting virtual images; maintaining virtual images in a repository; and deploying virtual images. The combination of Systems Director and VMControl can capture operational data and events at the level of hardware and specific virtualization platforms. Systems Director can then feed this data to IBM's Tivoli management tools, which can be used to manage advanced functions such as failover, disaster recovery (DR), and maintenance of Service Level Agreements (SLAs).

Tivoli tools provide integrated visibility, control, and automation across multiple business units and heterogeneous server platforms, including systems from vendors other than IBM. Tivoli is optimized for aligning IT operations with business at a high level, while enabling governance and control of automated business processes independently of specific hardware attributes. IBM Systems Director and Tivoli can thus be used to address many of the technical issues associated with virtualized infrastructures on an end-to-end basis, spanning multiple server and virtualization platforms.

### Univa UD Bridges Gap Between Private and Public Clouds

A third trend worth watching is the emergence of software suppliers that focus on bridging customers' current IT infrastructures with external cloud computing resources. Univa UD, a leader in grid computing (which in many ways was the precursor to cloud computing), offers several products and services that are designed to help customers incrementally introduce cloud computing into their operations. Univa UD's software is also designed to be used by third-party cloud service providers offering computing resources on a utility basis. The software deals specifically with the problems of deploying shared computing infrastructure. By creating a common software platform on both sides of the firewall, Univa UD hopes to become established as a key player when computing resources start crossing that boundary in volume. Some of Univa UD's key products include:

- UniCluster, a commercial release of Sun Grid Engine for performing resource management in cluster environments
- UniCloud, a product that unifies provisioning, configuration, and virtualization management to address problems such as cloud bursting, cloud clustering, and private cloud computing
- UniPlan, a workload simulation and analytics product that can be used to optimize allocation of computing resources

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IBM Systems Director and Tivoli can be used to address many of the technical issues associated with virtualized infrastructures on an end-to-end basis, spanning multiple server and virtualization platforms..

» UniSight, a performance and utilization data reporting mechanism for clusters

» Reliance, management software for maintaining Service Level Agreements (SLAs)

Univa UD also offers a variety of services to help end users and developers traverse various stages in cloud computing adoption, including packages for strategic assessment, migration, tuning, and ISV enablement. Univa UD expects that as the use of external cloud computing services starts to take hold, the current public cloud computing market may actually divide into two distinct groups:

» Consumer cloud services, such as Amazon's EC2, that offer commoditized versions of clouds, optimized for flexibility and low costs

» Enterprise cloud services, which are designed for customers who need precisely defined SLAs

With its software, Univa UD targets the needs of the second category, with the aim of assuring customers that computing resources delivered by third parties match the expectations they have for their own internal infrastructure.

### The IDEAS Bottom Line

Despite fascination with the prospect of tapping into third-party computing infrastructures, the most pressing concern for most users today is virtualizing as much as possible of their internal infrastructure into private clouds. For many users, the term "cloud" currently implies converging virtualized server, storage, and network resources into a single pool that workloads can draw upon as needed. Such a task presents many challenges, as these workloads may span multiple departments or business units, which may also be deploying different virtualization technologies. Hence, the management of these pooled resources becomes one of the most immediate requirements for building private clouds.

Microsoft, IBM, and Univa UD each address this problem differently, representing their unique perception of customer needs. Microsoft builds out tools that are optimized for managing operating systems, while IBM integrates the tools for managing its systems with its framework for managing enterprise services. Univa UD, on the other hand, focuses on bridging the distinct needs of end-users and third-party service providers. What these solutions all have in common is that none depend on the adoption of a single virtualization platform. The tools that can introduce virtualization management with the least disruption to existing infrastructure today are those that will be most effective in helping to introduce external cloud computing resources in the future. ■

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*Oracle's Sun . . . continued from page 2*

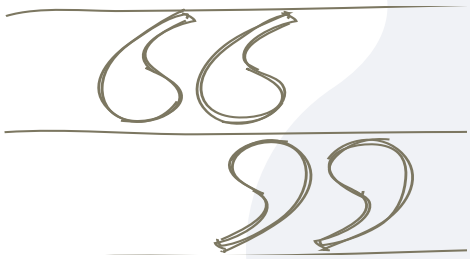
Database Machine is in line with the most scalable enterprise storage arrays in the market today. Hence, as attractive as the idea of hosting all data in SSS is, and as impressive as the Oracle Exadata's optimizations for Oracle RAC are, the potential customers for the Oracle Database Machine would only be those with a critical business case for extraordinary Oracle performance, as well as a sizable budget.

Some key takeaways from this Oracle announcement are:

» Flash memory is becoming a tremendous game-changer – providing a substantial low latency performance boost in memory/storage hierarchy architecture/design.

» The creation of integrated stacks of software optimized for hardware is an important rationale behind Oracle's acquisition of Sun. Oracle is not looking to battle in the low-margin commodity markets, but rather is targeting customers who value vertically integrated stacks.

» This Database Machine v2 does not necessarily reveal Oracle's plans for SPARC. The Exadata Database Machine is Linux/x86 and does not imply what Oracle plans for UltraSPARC T2 or SPARC64 servers. ■



## IDEAS Insights

**Blog Bites** (http://www.ideasint.blogs.com)

Historically, **industry-standard benchmarks** have focused primarily on the performance and price/performance of the tested configurations. The **SPC-1/E** Benchmark adds real-world **energy consumption** to the mix, offering more **detailed insight** into the various **tradeoffs** (performance, energy usage, and cost) of deploying **one product** – or one technology – **over another.**

From "What Are the Performance & Energy Tradeoffs of 15K vs. 10K RPM Disk Drives?"
Gary Burgess | October 13, 2009

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**IBM's recent earnings release** – lower revenues but higher earnings – brings to mind an old saying **"You can't save your way to prosperity."** Perhaps some **cutbacks** may turn out to be **short-sighted,** but those that **challenge/change** business **fundamentals** may yield long-lasting benefit.

From "IBM's Overlapping Design Teams Ensure Flow of New Servers"
Rich Partridge | October 16, 2009

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