Predicts 2004: Server Virtualization Evolves Rapidly

Use of virtualization technologies in servers will dramatically improve server utilization rates, increase server flexibility and reduce the overall spending required for servers.

Enterprises should change their thinking about consolidation and pursue a server virtualization strategy rather than a server consolidation project.

Server virtualization technologies pool and connect server resources in a way that masks the physical nature and boundaries of those resources from resource users. Virtualization is commonly used in mainframes, in terms of mixed-workload management and logical partitioning. Primarily because of effective virtualization on mainframes, utilization rates easily exceed the 80 percent range. Similar virtualization technologies for Unix, Windows and Linux are beginning to evolve rapidly and will have a significant effect on server deployment, management and expense during the next few years. In addition, new virtualization technologies, such as distributed resource managers (that relocate workloads between servers) and grid computing (that improves resource sharing and allows applications that can leverage parallel processing to run in available, distributed capacity), are evolving to increase the range of virtualization beyond the boundaries of a single server box.

Consolidation, on the other hand, is about "fewer" rather than about virtual resources (such as fewer data centers, fewer vendors, fewer servers and fewer management interfaces). Consolidation is still a worthy effort, but it should be done within a framework of long-term virtualization. In some cases, virtualization will mean using more resources rather than fewer — for example, using grid computing to replace a supercomputer. A consolidation effort that reduces virtual access to resources or limits future flexibility is not recommended.
Prediction: Use of partitioning and mixed-workload technologies will triple between 2003 and 2008.

Enterprises are demanding more ways to consolidate workloads, reduce server footprints and lower their costs. While processing power is getting less expensive, space, power, installation, integration and administration are not, and they cost the same whether a server is heavily or lightly utilized. Processor capability has outpaced the performance requirements of many applications, and many applications require even less power than a single Intel processor.

Resource managers — called partition managers, logical partitions (LPARs), virtual partitions (VPARs) and virtual machines — were first introduced to reduced instruction set computer (RISC) systems in the late 1990s, and similar support for Intel servers followed a few years later. Partitions on RISC and Intel servers are still immature in terms of full dynamic ability and scalability, but they are improving quickly. Originally used as a way to consolidate to fewer server frames, resource managers increasingly are used to share extra capacity (for small and large workloads) and for temporary provisioning (for development and test systems).

Windows-based Intel servers are both the most common server architecture and the most underutilized, on average. Use of VMware’s resource managers is growing rapidly, and, with the introduction of Microsoft’s Virtual Server in 2004, Microsoft’s endorsement of resource management should accelerate the trend.

Effective use of mixed workloads within an operating system is still years away, because of isolation and support issues for many of today’s applications (and also, in the case of Windows, immature workload management tools). Until mixed workloads mature, resource management will be the method of choice to virtualize server resources. Mixed-workload use will begin to accelerate in Windows-based systems in the latter half of this decade, especially for newer applications, and after the introduction of the Windows release code-named Longhorn. Distributed resource managers that re-provision operating-system images and applications from heavily utilized servers to larger or less utilized servers will also grow in use starting in 2004. However, they will remain less common until the technologies and their automation tools mature, and until standards emerge — in the second half of the decade.

A major inhibitor to any form of server virtualization is software pricing and licensing. Software vendors typically charge based on the size of the server or the number of processors. Most are...
not prepared to charge based on usage or percentage of system capability. As virtualization technologies become more effective, utility offerings expand and Web services become more prevalent, the market will force software vendors to change. However, software pricing and licensing will be the last major issues to be solved to enable effective server virtualization and will continue to be a general problem through at least 2007 (0.8 probability).

Strategic Planning Assumptions: By year-end 2005, 25 percent of Fortune 1000 enterprises will be using partitioning technologies (hardware or software) for Windows server deployments (0.7 probability). By year-end 2007, more than 40 percent of Fortune 1000 enterprises will be using partitioning technologies (hardware or software) for Windows server deployments (0.7 probability).

Action Recommendation for 2004

Consolidating workloads under a single operating system should be done when isolation is easy to confirm, workload management tools are effective enough to ensure appropriate resource allocation, and resource sharing can be automated and is flexible. However, for all other cases, enterprises should strongly consider resource management technologies that enable granular, dynamic and automated resource allocation — when workloads are spiky or temporary and can effectively share excess capacity. Because of the rapid evolution of these technologies, quick return on investment is important (12 to 24 months). For Intel servers, Microsoft's Virtual Server will lower the cost barrier to entry, and it should be considered along with VMware solutions, especially for development/test servers. Resource managers should not only be considered for large workloads targeting large symmetric multiprocessing systems — small workloads on high-volume systems will provide the best return on investment. Distributed resource managers should be considered leading-edge and relatively immature for now — worthy of consideration, but with caution.


Whereas mainframes are commonly utilized above the 80 percent range, RISC server utilization usually averages half of that, and Intel servers running at 10 percent to 15 percent utilization are common. Unlike mainframes, RISC and Intel servers are usually deployed with a single operating-system copy and a single application. The growth of virtualization technology deployment will create a significant discontinuity in the RISC and Intel server market. Utilization of RISC server capability should
increase by 30 percent or more. Intel server utilization should double.

Even assuming an increase in the cost per server for hardware, software and space, with a reduction in the number of servers and a reduction in the cost of administration per server, enterprises will realize significant overall savings. If mature virtualization technologies could be applied to RISC and Intel servers today, a conservative rough estimate is that overall IT spending in support of RISC servers would decline by 10 percent to 18 percent, while overall spending in support of Intel servers would decline by 20 percent to 30 percent.

Enterprise savings would primarily occur in administrative costs. However, spending on hardware would decline by as much as 18 percent (due to fewer servers), which could have a significant impact on server vendors.

Strategic Planning Assumption: By 2008, enterprises that do not leverage virtualization technologies will spend 25 percent more annually for hardware, software, labor and space for Intel servers, and 15 percent more on the same for RISC servers (0.7 probability).

Action Recommendation for 2004

Enterprises should start now to build a multiyear strategy for server virtualization. Metrics on overall server expenses should be measured and tracked. Technology offerings should be evaluated at least annually for possible deployment, first in pilot projects and then broadly based on results — but always with rapid return on investment and future flexibility in mind. Server consolidation projects should be pursued within the context of continual change in virtualization offerings every year. A consolidation project that takes more than two years to deploy or achieve a return on investment should be avoided. A server consolidation project that inhibits further use of evolving virtualization technology should also be avoided. Enterprises should change their thinking about consolidation and pursue a server virtualization strategy rather than a server consolidation project. Every time a server needs to be refreshed or upgraded, the enterprise should consider how to leverage server virtualization technologies as a part of the refresh. Also, enterprises should understand the virtualization offerings and strategies of their server vendors, and make that a part of their server selection process.
**Bottom Line:** Server virtualization technologies will bring mainframelike workload consolidation and flexibility to reduced instruction set computer and Intel servers through 2008. In addition, re-provisioning technologies will expand the boundaries of RISC- and Intel-based workloads, enabling them to be dynamically "right-sized" to larger or smaller servers when needed. The changes and offerings will be incremental, but they will build to result in significant cost and labor savings throughout the period — as well as increase flexibility to deploy new virtual servers quickly, change resource allocations to workloads quickly, and dispose of virtual servers quickly. Virtualization should become an ongoing effort and a part of the server strategy for every enterprise.

**Acronym Key**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPAR</td>
<td>logical partition</td>
</tr>
<tr>
<td>RISC</td>
<td>reduced instruction set computer</td>
</tr>
<tr>
<td>VPAR</td>
<td>virtual partition</td>
</tr>
</tbody>
</table>