EARS AFTER VIRTUALIZATION hit the market, industry experts say the dominant use for the technology in the enterprise remains server consolidation. Inside that subset of the virtualization market, Microsoft and some key partners are starting to put serious effort behind the idea of pairing server consolidation with the Microsoft SQL Server database.

SQL Server has made its bones in the industry by being the less-expensive alternative to Oracle or IBM DB2 databases, with comparable scale and reliability and a monstrously large feature set.
for the base price. While Microsoft has consistently made progress with mission-critical database applications, it still gets a run for its money on those bet-the-business applications from its enterprise competitors. Where SQL Server has proliferated is in the next few tiers of database computing. For a decade, SQL Server has been a go-to choice for second- or third-tier applications, quick departmental solutions and the like.

All that proliferation has contributed to enterprises having databases distributed throughout their networks—making it difficult for IT to know what applications are running, what software needs security updates and what applications would benefit from an upgrade. Additionally, having data spread throughout an organization can carry well-documented privacy and regulatory compliance risks.

One approach to those problems is to consolidate multiple databases into a single server in the data center, using virtualization technology. With the release of SQL Server 2008, Microsoft engineered into its flagship relational database management system a significant amount of new technology aimed at improving the ability to consolidate multiple SQL Server databases into one server. While the database is more than a year old, Microsoft only this year began pushing the consolidation-through-virtualization story with real force, and in fact the effort remains in its early stages.

Partners that can harness strong skills and practices in architecting data-management solutions to virtualization know-how could expand into a niche with a lot of growth potential.

Enabling Consolidation in SQL Server 2008

Some of the main consolidation-related features of the SQL Server 2008 release last year occurred in the SQL Server Management Studio, SQL Server Integration Services and among tools for migrating SQL Server 2000 or SQL Server 2005 databases to SQL Server 2008. Other changes key to consolidation strategies came in the 2008 wave of products that launched along with SQL Server, most notably the Windows System Resource Manager, System Center Virtual Machine Manager and, critically, Hyper-V. The cross-use of technologies also enables high-availability technologies, such as up to 16-node clusters and failover cluster support.

Not all SQL Server consolidation strategies involve virtualization. Microsoft’s recommendations include a few other paths. First is the option of consolidating multiple databases into a single database. A related option is consolidating multiple databases to a single SQL Server 2008 instance. Finally, multiple SQL Server 2008 instances can be put on a single physical server.

But the option with the most flexibility is putting multiple virtual machines (VMs) on each physical server using Hyper-V technology. A main advantage to using VMs is the level of isolation possible, allowing databases with different workloads, security requirements, manageability requirements or compatibility requirements to coexist on one physical box. Meanwhile, the other consolidation scenarios can each play a role within a VM, opening up a lot of possibilities.

Even as Microsoft begins peddling its database platform hard for consolidation scenarios, the company is taking an opportunity to improve the already mature platform with an R2 release. A community technology of SQL Server 2008 R2 became available in August (see “Microsoft Offers SQL Server 2008 R2 Test Bits,” p. 3, for details).

Consolidation Benefits

There’s a powerful potential licensing benefit for customers in consolidating. In a white paper about consolidation published by Microsoft this year, Martin Ellis writes, “SQL Server 2008 Enterprise enables you to purchase one Windows license and one SQL Server license for each physical processor on the server, and run an unlimited number of VMs, each of which can host one or more SQL Server 2008 instances. This makes it possible for a single powerful server to host as many SQL Server instances as you require, and to add instances to it in the future without incurring extra licensing costs.”

But licensing is only one area of potential cost savings. According to Ellis, consolidating SQL Servers can reduce total cost of ownership (TCO) by limiting:

- **Administration**, through standardization and reduction in number of servers and support staff
- **Operational costs**, such as data center costs, hardware expenses and power consumption, with the added trendy benefit of potentially reducing carbon consumption
THE FIRST COMMUNITY TECHNOLOGY preview (CTP) of Microsoft SQL Server 2008 R2 became available for testing in August. The CTP adds a few new features to Microsoft’s latest database management product.

One of those features is Report Builder 3.0, which succeeds version 2.0, released in April. Users can combine data and construct their own graphical reports via a Microsoft Office-like interface in Report Builder. According to a Microsoft blog, a new capability in Report Builder 3.0 is the addition of geospatial data.

Microsoft is also touting the ability to use Report Builder 3.0 in server mode, which takes advantage of the data-caching capability on the server for faster report generation.

The August CTP also includes tools for database administrators, such as new multi-server management wizards that can set up resource-use views. Users can set up dashboards to help assess application use of SQL Server 2008 R2.

Finally, database administrators can configure a data-tier application using the new CTP. A data-tier application combines “database objects with deployment requirements to help accelerate upgrades and deployments,” according to Microsoft’s blog.

Future CTPs, which are expected “in the coming weeks,” will include other improvements. For instance, Microsoft plans to start a private preview of “Project Madison,” which is Microsoft’s scalable data warehouse project that integrates parallel-processing technologies acquired from DATAllegro. In addition, a limited preview of “Gemini” data analysis add-in tools for Excel and SharePoint will appear.

Microsoft plans to add support for complex event processing with “StreamInsight,” which is Microsoft’s term for a near-real-time data-analysis capability in SQL Server 2008 R2. Also to be seen will be “the first CTP for SQL Azure Database.” SQL Azure is a database component in Microsoft’s Windows Azure cloud-computing platform.

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• **Rigidity of the infrastructure**, allowing organizations to be more agile in moving databases around and spinning up new ones in a well-managed, well-understood environment

### 100,000 Databases to Consolidate
Microsoft traditionally follows several steps when the company is trying to push a specific application of its technology into the market. The company often relies on its internal IT department to pilot the solution internally within Microsoft’s massive corporate network. Internally, the process is referred to as “dogfooding.” Out of the dogfood process, Microsoft IT provides feedback to the product groups involved and publishes the results as a case study, which can be used as a framework by both customers and partners for approaching the issues raised in a deployment scenario.

Microsoft IT did just that with SQL Server consolidation earlier this year. Using Windows Server 2008, Hyper-V (after a close compare/contrast between the benefits of Hyper-V versus Windows System Resource Manager) and SQL Server 2008, Microsoft IT began the process of creating an internal SQL Utility. Essentially the SQL Utility was designed as a central place where Microsoft departments could go when they needed to create a new database to support an application—essentially a centralized database service within the company.

In the process, Microsoft IT aimed to begin consolidation of its mind-bogglingly large population of databases. According to Microsoft’s recent technical white paper on the process, the current Microsoft IT application portfolio consists of about 1,300 applications. Supporting those applications are more than 4,700 SQL Server instances with about 100,000 databases on dedicated hosts. No one ever accused Microsoft of lacking ambition.

The company is starting with the lowest-hanging fruit. “The 2009 goal for the SQL Utility is to reduce dedicated SQL Servers single-instance hosts by 10 percent, in addition to laying the foundation for future consolidation efforts,” says Microsoft’s executive summary of the paper, “SQL Server Consolidation at Microsoft.”

One common-sense approach Microsoft followed in trying to identify underutilized servers was to label its thousands of databases according to a comparative scale. Using the categories of “hot,” “warm,” “cold” and “permafrost,” Microsoft measured servers by mean CPU percentage and maximum CPU percentage.

The amusingly labeled permafrost servers had a mean CPU utilization of less than 1 percent and a maximum CPU usage of less than 5 percent. Even the servers labeled hot only had a mean CPU utilization of greater than 20 percent and a maximum CPU usage of greater than 20 percent and a maximum CPU usage of greater than 50 percent.

As a technology vendor with a lot of proudly geeky employees who might spin up a database as soon as pick up the phone, Microsoft’s circumstances are unique. Nonetheless, the results make a startling case for virtualization. Fewer than 5 percent of the databases in the organization qualified as hot. More than half were classified as permafrost or cold, a designation covering databases with a mean CPU usage of less than 5 percent and a max CPU usage of less than 20 percent.

When considering which databases to put on the SQL Utility first, Microsoft prioritized permafrost or cold SQL Server instances running on a physical host, end-of-life servers that needed a replacement (about 20 percent per year), new servers for new applications requiring a database server and some proactive migrations.

In general, Microsoft is aiming for a 6:1 consolidation ratio. With newer, more powerful
servers, Microsoft expects to save power and space and reduce pollution. Servers deployed in the SQL Utility generally take up less than 1U of rack space, compared with the 6.8U of rack space of the average replaced server. Other advantages of the new servers are that they can run hotter, requiring less cooling than their predecessors; and they can be loaded up with VMs to do nearly eight times as much work and still use less power—about 313 volt amps compared to 369 volt amps for end-of-life machines. “Because Microsoft IT will purchase fewer physical servers in the new consolidated environment, there will be less hardware to recycle as [end of life] is reached,” the white paper states.

In all, Microsoft IT expects to reap several benefits out of its SQL Utility program and the effort to consolidate databases. “A SQL Server instance is projected to cost 44 percent less to operate per year when managed through the SQL Utility. Microsoft IT therefore expects the SQL Utility to reduce operating costs by $11 million per year,” according to the technical white paper. At the same time, Microsoft IT expects to improve business continuity, scalability and availability while reducing deployment times through the use of standardized builds on Hyper-V and the other technologies.

**Getting Aggressive on Virtualization**

The SQL Server 2008 consolidation scenarios pushed by Microsoft focus on the company’s own Hyper-V products, relying on synergies between the company’s products to try to box out virtualization industry giant VMware Inc. Although Microsoft is gaining traction and has aggressive plans, VMware remains tops in market share.

How aggressive is Microsoft? Kevin Turner, chief operating officer, made a splash in July by telling partners that there’s an opportunity to claw share from the virtualization heavyweight.

“Microsoft partners in the room that have adopted our Hyper-V and our virtualization story, this is for you. For the partners in the room that haven’t entered the virtualization business, this is for you. The partners in the room that are selling VMware versus us, just please tune out during this segment because we want to take your market share. We launched this product in October of last year. Since October of last year, we’re at over 24 points of market share from the day we put it in the marketplace,” Turner said, before dinging the competition on price.

“So I hear a lot about margins: ‘Hey, the VMware program’s got higher margins.’ Well, if I charged you $58,000, I’d give you higher margins, too. That’s not what we charge customers. We charge them $9,600 and that’s why our margins are what they are. So, as you line up to make your bets, if you want to bet against us in this particular space, we’re coming right at you.”

Turner’s comments on Microsoft’s market share were met with skepticism by many industry observers. Framingham, Mass.-based IDC last October released market share numbers in the x86 server market that had VMware at 44 percent for VMware ESX and VMware Server, while Microsoft was at 23 percent for both Virtual Server 2005 and Hyper-V.

Estimates by market researchers at Stamford, Conn.-based Gartner reportedly gave VMware a much larger share of the virtualization market more recently. Apparent differences in methodology make it unclear where things stand. The fact that Hyper-V is available as part of the Microsoft operating system could serve to make market share estimates even fuzzier in the future.

In any event, virtualization is a land-grab for server vendors. The IDC figures from October 2008, the last of the firm’s quarterly data trackers on virtualization to be partially published for free, put Hewlett-Packard Co. at No. 1 for worldwide new server shipments virtualized at 34 percent market share, Dell Inc. second at 25 percent and IBM Corp. third at 16 percent. At the time, HP was growing 52 percent year over year and Dell was growing 110 percent year over year.

Meanwhile, database consolidation could be getting more attractive to vendors as easy server consolidation business gets harder to find.

“Based on our conversations with end users, IDC believes that the high-volume consolidation opportunities—the low-hanging fruit in the x86 server virtualization market—are starting to dry up. This, in turn, is resulting in smaller deals overall,” IDC Analyst Brett Waldman said in a statement accompanying the October data.

Andrew Hargett, Dell’s global alliance manager for enterprise software, believes a fairly small percentage of customers with databases have even looked at consolidating them yet. “Probably only 20 percent to 25 percent of the database market has
really taken a serious look at consolidation. I think there’s a tremendous demand, tremendous need, even tremendous interest in trying to understand the guidelines, the parameters and the prescriptive guidance that Microsoft and/or Dell would give,” Hargett says.

At the same time, Hargett is seeing that more than half of the install base is still running SQL Server 2000. “What we’re hearing and seeing is a lot of these folks are staying with those older installs because of the apps,” he explains. “Their applications either don’t migrate to SQL 2005 or SQL 2008, or it’s an ‘it works, don’t fix it’ kind of deal.”

Partners, to a large extent, are in the same boat as customers, Hargett says: “They suffer from the same thing that the customer base suffers from: They’re still coming up to speed with the technology themselves. They’re really trying to understand what’s the best approach. There are not a whole lot of best practices just yet.”

Meanwhile, while the opportunity benefits the Dells, HPs and IBMs in terms of new server sales; benefits partners in terms of services sales; and benefits customers in reducing all kinds of costs, it’s not necessarily a great development for Microsoft in some ways. “Customers are saying, ‘We need to green-up our data center a bit, and let’s take an intelligent look at our apps—especially tier two or tier three apps. Let’s see if we can’t do a consolidation from 50 to 20 servers,’” Hargett says. “What’s interesting is, of course, Microsoft doesn’t like it when a customer doesn’t have quite as many instances of SQL, so they’re actually saving a bit on their server architecture.”

Dell hopes partners will start selling customers on the benefits of virtualizing their SQL Server infrastructures, and is trying to lead the way with direct customer engagements that build up intellectual property that partners can use.

“From a partner standpoint, the thing we’re trying to do is build a lot of collateral, a lot of use cases and reference materials that we can push back to our channel partners that give them a framework,” Hargett says. “We’ve got the SQL database guys on staff—let us come in and look at utilization rate, number of users, really do the very intelligent assessment and determination. We’ll assess the environment, determine which servers are the candidates for consolidation—and then partners do the deployment.”

Perhaps reflecting Microsoft’s lower incentives to drive customers to consolidate, Dell has been pushing consolidation for a long time. In a case study published in September 2008, Dell consultants helped Maxol, an independent oil company in Ireland, consolidate a server infrastructure that included SQL Server 2005 and save money.

Dublin-based Maxol, a 128-person firm with $1.2 billion in revenues, hired Dell Global Infrastructure Consulting Services to create a Hyper-V solution. Dell helped Maxol consolidate 15 physical servers onto a four-server cluster running Windows Server 2008 Enterprise and Hyper-V on Dell PowerEdge 2950 III hardware. Eventually, Maxol intended to take 22 servers—counting the 14 already consolidated—down to six machines.

Maxol’s estimates, according to the case study, are for $94,000 in hardware savings and $47,000 in electrical cost savings over three years, while server utilization had jumped from 10 percent to 30 percent.

**Conclusion**

So far, the Maxol deployment is one of the only case studies in the Microsoft customer evidence library that covers both Hyper-V and SQL Server. As Hyper-V deployments proliferate and major vendors put more resources behind the opportunity and into helping the market understand the opportunity, expect to see a lot more activity around database consolidation.

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