CHAPTER ①

The case for SQL Server consolidation

Many SQL Server shops suffer from uncoordinated installations, wasted hardware and licenses, lack of standards and security holes. Can consolidation help?

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INSIDE

The case for SQL Server consolidation

By Hilary Cotter

THE NUMBER OF deployed instances of Microsoft SQL Server in the enterprise continues to grow more rapidly than the rollouts for any other database management system (DBMS). The reasons are clear; Microsoft set out to provide a powerful DBMS that meets multiple goals for IT organizations. SQL Server is designed to deliver scalable solutions while offering ease of use and deployment, self maintenance and tuning, low resource overhead, and low skill set requirements.

Microsoft provides product versions that contain similar feature sets priced to help build community. For example, the Developer version of SQL Server has the same feature set as the Enterprise version. In addition, Microsoft launched evangelistic efforts to build a community around the DBMS.

These attributes and the consequent popularity of SQL Server have resulted in an explosion of installations in the corporate environment. This phenomenon is frequently described as SQL Server sprawl, although it is sometimes disparagingly called an infestation.

There's a downside to this

"Consolidation is the combination of SQL Server databases running on different machines — typically geographically dispersed — onto a smaller number of more powerful machines in a central location."

SQL Server's popularity has contributed to an installation boom known as SQL Server sprawl.

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boom. It has led to uncoordinated installations, wasted hardware and licenses, lack of standards in an enterprise, and security holes.

These problems can be mitigated by SQL Server consolidation. Consolidation is the combination of SQL Server databases running on different machines — typically geographically dispersed — onto a smaller number of more powerful machines in a central location. The result is greater performance and reliability, particularly on 64-bit SQL Server 2005, which provides overall improved performance and better memory management than its SQL Server 2000 counterpart.

For many shops it's "all Microsoft all the time."

Causes of SQL Server sprawl

Large numbers of SQL Server installations frequently waste hardware resources and licensing fees, and ultimately turn unmanageable. Yet SQL Server's strengths are among the root causes of this sprawl: It's often just easier to add more instances of SQL Server than to be proactive about managing the problem. Here I'll explain why:

EASE OF INSTALLATION: For a successful SQL Server installation, you are only required to put the CD-ROM in the drive and accept all defaults in the subsequent dialogs. These dialogs are intuitive for even the most junior database administrator (DBA), network administrator or non-technical person.

COMMUNITY: SQL Server is often the DMBS of choice for shrink-wrapped software thanks to its ease of deployment, availability through the free distribution of Microsoft SQL Server Desktop Engine (MSDE) or SQL Server 2005 Express, and community support for code development. The Microsoft platform is strongly biased to using SQL Server for the DBMS. SQL Server also tends to be the simplest to develop on, has the largest community surrounding it, features the best support, and offers the greatest number of books on every facet of development.

BRAND LOYALTY: SQL Server is often chosen as a departmental DBMS because it carries the Microsoft brand, and Microsoft products are already entrenched in the department. Employees are familiar with using Microsoft products, they

know how to navigate Micro-soft support options and they feel comfortable with the look and feel of Microsoft prod-ucts. For many shops it is "all Microsoft all the time." While other DBMSs do offer ports to the Windows platform there is a general bias against them because they are considered to be outside of the department's comfort level.

SELF MAINTENANCE AND SELF TUNING: SQL Server is largely self maintaining and self tuning, requiring little or no adminis-trative input. This adds to the favorable impressions of SQL Server, and increases the com-fort level for department man-agers. Managers want simple lives without complexity. Some DBMSs are notorious for their support overhead and difficulty. Figures are hard to come by, and each vendor boasts how their product offers the lowest

total cost of ownership. Howev-er, the reality is that most shops supporting a variety of plat-forms have more DBAs manag-ing the other vendors' products, even for a comparable number of servers, than they have DBAs managing SQL Servers.

FAMILIARITY: The number of people familiar with SQL Server is growing exponentially due to the fact that MSDE is shipping with every version of Office and Visual Studio. Microsoft's mantra is that these products are "better together," while the reality is "lock yourself in; you'll love it," according to InfoWorld's Tom Yager *(thanks to PASS President Kevin Kline for pointing out this nugget).* This broad familiarity will only in-crease now that there is a free version of SQL Server 2005 — namely SQL Server Express. This may replace MySQL as the platform of choice for open

Can SQL Server sprawl be blamed on SQL Server's strengths?

→ **SQL Server instances can be added easily by even the most junior DBA.**

→ **SQL Server is easy to deploy and available through MSDE.**

→ **Little to no administrative input is required for maintenance and tuning.**

→ **SQL Server's pricing model is attractive compared to other DBMSs.**

→ **Microsoft products are already entrenched in many departments and work "better together."**

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source development and in academic communities. Computer science students soon will be graduating with SQL Server experience under their belts.

LOW COST: SQL Server is competitively priced as one of the lowest of all DBMSs — the pricing model makes it very attractive.

"SQL Server sprawl spells headaches for managers when it comes to maintaining or patching a large number of installations distributed over a LAN or WAN."

Pitfalls of SQL Server sprawl

The boom in uncontrolled and uncoordinated SQL Server deployments has led to numerous challenges for the enterprise.

LET'S START WITH WASTED HARDWARE RESOURCES. In many departmental implementations of SQL Server the hardware is grossly oversized for the workloads. Sometimes excess hardware is pushed by overzealous hardware vendors; and sometimes the department overestimates its workload or growth. You may also find that the workload would have been more appropriate for a desktop PC. Checking CPU usage reveals that these SQL Server configurations seldom consume more than 5 to 10% CPU utilization.

SQL Server sprawl spells headaches for managers when it comes to maintaining or

patching large numbers of SQL Server installations distributed over a LAN or WAN. These problems are exacerbated by the fact that DBAs or network administrators may not have such base information as who administers individual machines, the administrator passwords or the machines' locations. They may not have negotiated a maintenance window with the clients or know the consequences of the servers going off line. Consider the case where a virus targeting SQL Server hits your network, and you need to patch all of your SQL Servers immediately. Locating them and patching them is a challenge when there is

no central point of administration. This becomes even more problematic with developer machines when many of them are running MSDE, SQL Server Express or SQL Server Personal Edition.

Individual SQL Servers in such dispersed environments are poorly managed. For example, they may not have the latest service pack or patch level, or may be two versions out of sync. This leads to two problems. First, the version might be scheduled to retire from active support; and, second, the DBA team may not be familiar with the version. That means that it takes the DBA longer to fix the problem, and it takes him away from other essential tasks at hand. In addition, gaps in management may mean that indexes are not maintained, which hampers overall performance for applications using the database.

Standardization suffers when SQL Server implementations get out of hand. With SQL Server 7 it was common to have SQL Servers using mixed-mode authentication with a blank "sa" password. This was not only a security fault, but Trojans could scan a network looking for such unsecured machines and launch exploits on them. A lack of standards can cause other problems, such as the lack of backup procedures or transaction log maintenance, or unchecked code, which might leave SQL Servers prone to SQL injection attacks. Microsoft Baseline Security Analyzer does help to identify servers with security vulnerabilities.

Smaller, departmental SQL Servers do not have high availability requirements, so an uptime of 9-to-5, Monday-through-Friday is sufficient for most database applications. However, these departmental

SQL Servers can consume large amounts of a DBA's time trying to recover from failures if enterprise-level disaster recovery plans don't factor in a department's reduced availability requirements. Such firefighting is an ineffective use of the DBA's workday. Unless rigorous planning is done to ensure point-in-time backups have been completed and verified, there may be partial or complete data loss. Part of this equation entails frequently moving the backups off the machine to a vault, preferably offsite. If copying the dumps to tapes is part of this solution, the tapes must be tested and archived as they age and outlive their useful life span. Remember that tapes received a bad name for some companies affected by the Sept. 11 terrorist attacks when they found the tape backups to be unusable.

The dispersed server also

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may house the little application that grew. This is an application that was written by an amateur or someone with a lower skill set, and has become critical despite its shortcomings. While this application may have initially performed well, it simply is not scalable. Solving one bottleneck only reveals another. This application may require more maintenance than a better written application due to flaws such as its reliance on cursors or poor indexes.

There's a financial impact to SQL Server sprawl that goes beyond hardware and administrator costs. That is wasted licensing. A single SQL Server implementation with the correct licensing actually may be over-licensed. There are two licensing modes for SQL Server: per-seat and per-processor. Per-seat licensing is best used when you have a small, known number of clients connecting to

Choosing your SQL Server licensing mode

PER-SEAT LICENSING: Best when you have a small, known number of clients connecting to SQL Server.

PER-PROCESSOR LICENSING: Best if you have a large number of users connecting to SQL Server.

your SQL Server. Per-processor licensing will work best if you have a large number of users.

Things get tricky and problems can emerge when you start consolidating SQL Servers and stack databases on a single server or cluster. With luck, you will have the same users accessing different application databases on the same server, and this will result in an overall net savings in per-seat licensing. Assume that you had an accounting group of five users accessing two SQL Servers. Without consolidation this would require two SQL Server

licenses with five client access licenses (CALs). Consolidating these two databases on a single SQL Server installation would mean a savings of a server license.

However, you will commonly find the number of users connecting to your consolidated SQL Server solution increase, so the per-processor license will make more sense. By consolidating on state-of-the-art machines you can leverage Moore's law and get more performance for your hardware dollars.

Some workloads require you

to consolidate SQL Servers running on machines with greater horsepower and memory. On SQL Server 2000, this may mean upgrading to Enterprise Edition, which offers access to greater memory and clustering. Unlike its predecessor, SQL Server 2005 Standard Edition already offers better accessible memory and clustering.

You will also find a limit on how many databases you can support on a single instance of SQL Server. I don't mention operating system license consolidations because most people who decommission a SQL Server repurpose the machine for some other use, and the operating system license is also repurposed. You may save costs in monitoring licenses through use of NetIQ Corp. tools or Microsoft Operations Manager (MOM).

How consolidation can help
Consolidation offers many benefits. These include:

- **IMPROVED UPTIMES:** Consolidated environments normally mean better managed machines running on clusters with a storage area network (SAN) in the background. This helps deliver enterprise-wide four to five "nines" reliability and availability.

- **IMPROVED PERFORMANCE:** Consolidated environments allow you to have many databases running on high performance hardware, typically with a fast disk subsystem, ample memory and 64-bit machines. This means queries run in parallel and much faster than on 32-bit machines.

- **IMPROVED MONITORING:** A consolidated environment supports many databases on a single machine, so uptime becomes very important. Monitoring becomes proactive rather than reactive, optimizing performance and uptimes.

- **MORE EFFICIENT USE OF HUMAN CAPITAL:** A consolidated environment typically requires fewer people, freeing DBAs from routine tasks to focus on planning and engineering. Compartmentalizing functionality into a dedicated group leverages knowledge that may not otherwise be available: A recovery group dedicated solely to recovering SQL Servers will learn all aspects of backup and restore, tailor the best solution for each problem and offer better turn around times over a DBA who is not familiar with recovery or a server's recovery solution.

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What to consolidate

In a perfect world consolidating all SQL Server instances would be a simple task. However, in the real world, consolidation requires careful planning and consideration. I'll begin with important considerations when consolidating servers. Then I'll go into consolidation issues for storage.

SERVER CONSOLIDATION
When consolidating servers, you should expect politics to be a factor. Quite frequently, departments are unwilling to turn over management of their databases to another group. Sometimes, these concerns stem from turf wars. More often the worry is that the SQL Server databases will no longer enjoy the level of support that users are accustomed to once the servers gain new owners. Managers must take care to ensure that the consolidated solution will offer better support than what they are currently receiving in-house, and it is essential

that a Service Level Agreement (SLA) is established so that expectations are fully understood by the user department and the new server owner.

Server consolidation also calls for fault tolerant hardware. When consolidating multiple databases onto a single server, realize that if that server fails, you no longer have just a single database out of commission. Every database on the consolidated server is at risk, and visibility is now much higher. Instead of a single department being inconvenienced, many departments now feel the impact of the failure, and this can

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undermine confidence in the consolidation effort. This means you need to cluster your SQL Server installations using SQL Server 2000 Enterprise Edition or SQL Server 2005 Standard Edition and above, along with Windows 2000 Server or Windows Server 2003. You may also need more expensive hardware and clustering training for your DBAs and network administrators.

Clustering is a technology that allows the virtualization of shared resources to be present-ed to a client as a single server. Clients connect to the virtualized server and access the resources of a single node. Should this node fail, clients reconnect to another node in the cluster.

Microsoft implements two flavors of clustering: single-instance (active-passive) and multi-instance (active-active). In single instance, one node is active and the other node is offline. Should the active node fail, the passive node is brought online and resources are failed over to the newly active node. In multi-instance clustering, both nodes are active at the same time; should one node fail over, the other node's resources fail over to an active node and clients access both nodes simultaneously. In this case, all nodes must have hardware resources not only to run their own workload but also to support workloads from other nodes that may fail over.

"When consolidating multiple databases onto a single server, realize that if that server fails, you no longer have just a single database out of commission."

Server consolidation: *An approach to the efficient usage of computer server resources in order to reduce the total number of servers or server locations that an organization requires.*

In server consolidation you must consider how accounts and security models overlap. Occasionally you will find SQL Server authentication accounts or even local machine accounts with the same names but different passwords. When you consolidate the servers these accounts collide.

Memory limitations in a 32-bit system will likely require you to migrate to a 64-bit sys-

tem. SQL Server 2000 32-bit can only access 2 GB of virtual memory (3 GB with the 3-GB boot.ini switch in Windows Server 2003). With the Physical Address Extension (PAE) switch the data cache will be able to access up to 8 GB of memory on SQL Server Enterprise Edition running on Windows Server 2003 Enterprise Edition, and 32 GB on Windows Server 2003 Data Center Edition. However, the user, procedures and log caches will be able to access only 1 GB of the

"SQL Server 2005 64-bit is the best choice in consolidation projects because there are no memory limitations."

available RAM on SQL Server Enterprise Edition. The SQL Server 2000 64-bit version did not support all functionality of the 32-bit version, including third-party iFilters, Data Transformation Services (DTS) and SP_OA procedures.

SQL Server 2005 64-bit is the best choice in consolidation projects because there are no memory limitations, though some companies are taking a cautious approach with this release and waiting until Service Pack 1 comes out. There are also some upgrade issues that may complicate migrating applications to SQL Server 2005. For a list of these problems, run SQL 2005 Upgrade Advisor or check the online help file, which ships with the Upgrade Advisor, and search on Resolving Upgrade Issues.

Don't forget to consider cost in planning your consolidation effort. I have already mentioned

the potential costs incurred from investing in larger servers, enterprise editions, 64-bit architectures and the per-processor licensing model. In some circumstances, you may also need to stack your databases on different instances to prevent one SQL Server from consuming all of tempdb or to try to isolate databases by workload.

STORAGE CONSOLIDATION
You also have the option to consolidate storage, which normally means either using a storage area network (SAN) or network-attached storage (NAS). Most departmental servers will use locally attached storage, or as they are frequently called JBOD ("just a bunch of disks"). Windows supports a total of 26 drive letters — A through Z. Typically, the largest number of available drives will be only 22, assuming that one drive is as-

signed to the CD-ROM, drives A and B are not used, and C is used by the operating system. Most installations will consolidate storage on one or two RAID arrays consuming two to three drive letters. However, some applications will require a multitude of file groups assigned to their own letter.

LOCALLY-ATTACHED STORAGE can be faster than SANs for some workloads. Although, SANs with large caches can offer better performance than locally attached storage; a large checkpoint or a transactional system can easily overwhelm the 128 MB or 256 MB cache of a typical, locally attached storage controller. Locally attached storage can have some levels of fault redundancy, but it presents several problems in large enterprises.

It can be difficult to back up local drives over a network. In large enterprises each server to be backed up could have two network cards, one facing public and another connected to a private network used by backup agents. Also, if a server goes down it is frequently difficult to migrate the storage to another server. The difficulty may be a driver problem, but more frequently it lies in the need to move the RAID array or enclosure from one rack to another. Finally, it is often tricky to increase the drive size without bringing the server down or the drive itself offline.

SANS NOT ONLY SOLVE ALL OF THESE PROBLEMS, they add many features that are essential to large enterprises. For example, most storage vendors provide real-time mirroring capabilities where a byte-level backup of even live files can be performed in seconds, and sometimes even multiple cop-

Storage consolidation

Storage consolidation, also called storage convergence, is a method of centralizing data storage among multiple servers. The objective is to facilitate data backup and archiving for all subscribers in an enterprise, while minimizing the time required to access and store data.

ies of the backup can be made simultaneously. Enterprise-wide backups and recovery can be performed quickly and efficiently off the SAN rather than over
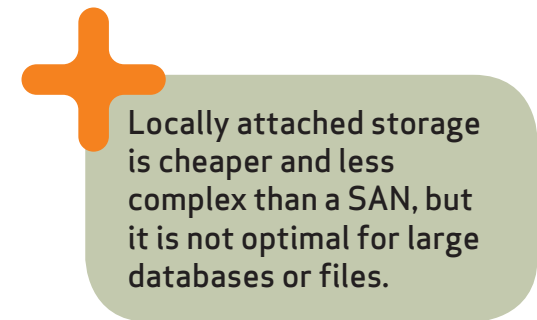
the private backup network.

SANs offer greater reliability than locally-attached storage for several reasons. SAN vendors tend to have a rigorous drive certification process where they ensure that the drives used in their SANs offer the longest mean time to failure, surpassing those of the major hardware vendors. They also continually perform online diagnostics and benchmarking to anticipate failing drives. When a drive is considered to be failing, the data is reallocated to new drives and the failing drive can be swapped out with a new drive. SAN drives can be dynamically resized without the drive going offline. If a server goes down, another server can quickly be reattached to the "drives" used by the old server with a minimal amount of reconfiguration. SANs also work well with clustered servers. SANs are centralized in one data center and typically in one enclosure, managed by one dedicated team with deep knowledge of the particular vendor's SAN.

NAS IS NETWORK-ATTACHED STORAGE somewhat similar to a SAN. However SANs dedicate a drive or a logical unit number (LUN) to a server or a cluster. A NAS provides a share point so that one or more servers can access the data. NAS is not normally used with SQL Server because a NAS provides only a file share, not a drive to the SQL Server. While SQL Server can use this share, the result typically is poor disk access performance.

In terms of making your storage investment, you'll find that SANs work well with clusters, offer better recovery and copying options for large databases or files, and perform better than locally attached storage. But they come with a significant cost and require a dedicated skill set. NAS, on the other hand, is best used for sharing large numbers of smaller files among servers (i.e. Web pages, documents), but it is not ideal for database files or other write-intensive applications. Locally attached storage is cheaper and less complex than a SAN, but it is not optimal for large databases or files, and it does not offer the performance level of a SAN for large write-intensive operations.

> Locally attached storage is cheaper and less complex than a SAN, but it is not optimal for large databases or files.
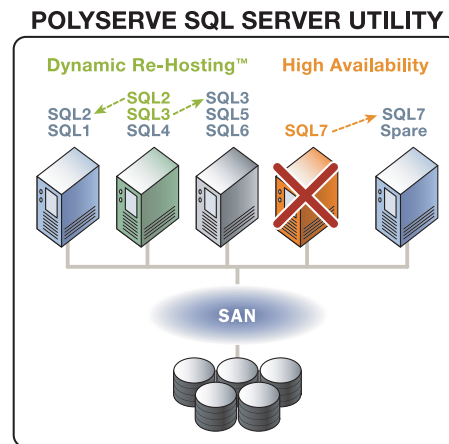
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▶ ASSURES FULL DATABASE AND SERVER FAIL-OVER WITHOUT ADDED COST OR COMPLEXITY
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Now you can avoid the pitfalls of virtual machine strategies that limit performance and increase system failure risk. Through PolyServe's unique approach to server virtualization for SQL Server consolidation, you can finally reduce the cost and time required to manage many mission-critical SQL Server databases.

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PolyServe's unique approach features a shared data cluster file system that allows you to consolidate up to 16 multi-processor servers and 240 instances of SQL Server into a single, unified cluster. There's no virtual machine software to limit performance and it actually reduces the number of software installs to manage. With full support for 64-bit computing and SQL Server 2005, the PolyServe SQL Server Utility offers unmatched power, flexibility and ease of use for any SQL Server deployment. Learn more:

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SQL1   SQL4

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SQL3
SQL5
SQL6   SQL7 ----→ SQL7
        SQL7   Spare

SAN

SQL Server Utility

Finally, you have a dedicated solution that enables multiple SQL Server instances to be consolidated onto fewer servers. Powerful benefits of the SQL Server Utility include:

- **Improved Uptime:** High Availability services that are guaranteed for all SQL Server instances and can be easily configured to run on a mix of servers.

- **Improved Performance:** SQL Server still runs directly on the Windows Server OS; no virtual machine overhead, no CPU limitations, just bare-metal performance.

- **Improved Monitoring:** Matrix Manager provides a single cluster management point for monitoring cluster-wide IO performance, storage capacity and usage and server health. Establish multi-tiered failover targets for guaranteed availability.

- **Improved DBA efficiency:** Push installs, hot-fixes and updates of one instance to all failover targets automatically. Re-host online instances to another server via "drag and drop" to perform server maintenance or capacity upgrades. Significantly simplify and streamline backups.

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Key consolidation questions to ask

Now that we've looked at the pros and cons of SQL Server and storage consolidation, there are several questions you must answer before you can determine whether it will work for you.

① DO YOU NEED TO OPTIMIZE HARDWARE RESOURCES?

Optimizing hardware resources means you are providing adequate resources for current and future SQL Server workloads. This is traditionally called sizing or capacity planning. It also means that your database objects are adequately tuned or optimized so that you get the most performance per dollar spent on hardware.

Vendors will help you with capacity planning. Naturally they will tend to sell you over-powered solutions, but this can work in your favor if you need room for future growth; you need a modular hardware solution that has headroom so you can plug in or remove resources as your workload changes; you feel a conservative margin of error never hurts; and you believe these machines can be repurposed or sold as the project completes its lifecycle.

Tuning and optimizing database objects for changing workloads are time-consuming tasks that are more art than science.

Consolidation questions to ask yourself:

① Do you need to optimize hardware resources?

② Should you standardize on a single platform?

③ Do you want centralized database management?

④ Does your business plan call for a scalable environment?

⑤ Do you need to reduce costs?

Tools such as Quest Software's Spotlight on SQL Server, BMC Software's Patrol or Symantec Corp.'s (formerly Veritas) i3 can help to identify which hardware and database objects are bottlenecks, as well as particular indexes or procedures that need tuning. Due to the time consuming nature of this task, proper baselining with an eye tuned for quick wins is a prudent strategy.

One of the benefits of consolidating SQL Server databases on a server with significant hardware resources is an overall increase in performance through parallel processing, and the fact that most workloads can take advantage of the 64-bit chipset.

② SHOULD YOU STANDARDIZE ON A SINGLE PLATFORM?

Good programming practices dictate that you should segregate development into tiers (i.e. a Web tier, middle tier and data tier), with an eye toward platform and vendor independence. However, in practice, each tier tends to be hand-tuned toward a particular vendor for performance reasons. As a consequence, porting from one vendor to another can be a major undertaking. Sybase's own SQL Server is one product that does port to Microsoft's SQL Server with a minimum of effort. However Sybase is entrenched on Unix platforms, which normally means some recoding on the middle tier.

You can also consolidate Microsoft SQL Server installations into single version, preferably SQL Server 2005. Microsoft has spent considerable resources to ensure that SQL Server 2000 will port flawlessly to SQL Server 2005, and there should be

After consolidation, you will be able to build DBA teams dedicated to specialty areas, including replication, backup and recovery, monitoring and tuning.

"Tuning and optimizing database objects for changing workloads are time-consuming tasks that are more art than science."

much fewer problems upgrading database applications if careful migration steps are taken. You also have the option of running your databases in SQL Server 7 or SQL Server 2000 compatibility mode on SQL Server 2005.

If you do run into problems consolidating your application's database on SQL Server 2005 64-bit you may want to consolidate them onto a separate server running legacy 32-bit SQL Server 2000.
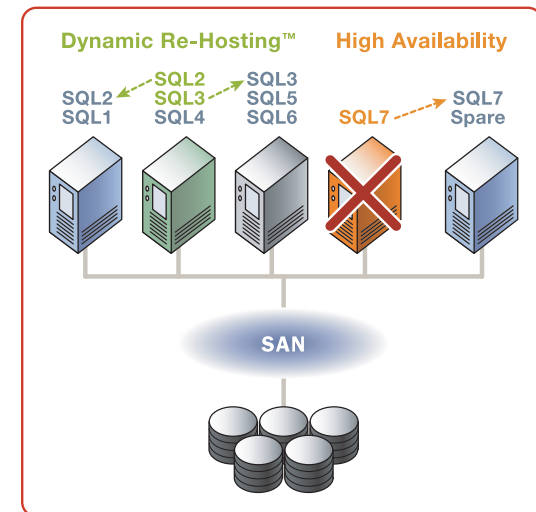
Another factor that may prevent you from consolidating onto a single DBMS vendor offering is that some IT departments like to diversify their platforms to prevent dependence on a single vendor. This corporate direction should not prevent the SQL Server consolidation effort because there are considerable benefits from this.

③ **DO YOU WANT CENTRALIZED DATABASE MANAGEMENT?**

Centralized management offers advantages such as efficient use of human resources, knowledge management, standards implementation and improved backup and recovery.

The most significant benefit is efficient use of human resources. After consolidation, you will be able to build DBA teams dedicated to specialty areas, including replication, backup and recovery, monitoring and tuning. By compartmentalizing by function, teams reap knowledge management benefits, gaining expertise in a particular area without having to get up to speed on different technologies. They can enforce standards that work best for them and the enterprise instead of implementing an

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uncoordinated set of procedures. Pain points will have higher visibility, and can be solved by carefully engineered solutions instead of quick fixes. Centralized management allows you to quickly create inventories of your SQL Server instances, and to implement standards and operating procedures for backups, restores, security and best operating practices.

4 DOES YOUR BUSINESS PLAN CALL FOR A SCALABLE ENVIRONMENT?

Growth is the life blood of every industry. Your SQL Server environments must be able to keep up with business growth. A centralized environment allows for more dynamic allocation of resources as the resources are in a single location. Centralized management normally means highly modularized, and collecting information on them is a simple matter.

5 DO YOU NEED TO REDUCE COSTS?

SQL Server consolidation can significantly reduce costs with careful planning. While there will be initial expenditures in purchasing clustered 64-bit hardware and licensing, there will be considerable freeing up or hardware resources and licenses which can be repurposed or sold. When making purchasing decisions you should carefully factor in headroom to account for growth to deliver a scalable solution. Consolidation also means more efficient use of DBAs by compartmentalizing functions.

ABOUT THE AUTHOR

Hilary Cotter has been involved in IT for more than 20 years as a Web and database consultant. Microsoft first awarded Cotter the Microsoft SQL Server MVP award in 2001. Cotter received his bachelor of applied science degree in mechanical engineering from the University of Toronto and studied economics at the University of Calgary and computer science at UC Berkeley. He is the author of a book on SQL Server transactional replication and is currently working on books on merge replication and Microsoft search technologies.

Summary

In this chapter we looked at the causes and pitfalls of SQL Server sprawl, including:

- Poor management and lack of standards
- Difficulty patching large numbers of SQL Servers in geographically dispersed locations
- Inefficient use of hardware
- Wasted licensing

Consolidating SQL Servers allows you to avoid these issues by managing your enterprise more efficiently, monitoring more effectively, enforcing standards, providing higher availability and getting greater performance for your hardware dollar.

An added bonus of a consolidated SQL Server environment is better overall performance and labor compartmentalization. For example, DBAs can spend more time planning and being proactive as opposed to managing and fighting fires.

SQL Server consolidation does require careful planning and SLA negotiation with clients; poor planning will affect many customers and may cause them to lose confidence in your consolidation efforts. To help you prepare for this undertaking, **Chapter 2** will focus on how to plan your SQL Server consolidation, including how to correctly size your server farm, how to identify if a SQL Server is a good consolidation candidate and how to handle some consolidation challenges. **Chapter 3** will present a methodology to follow while planning, testing, deploying and monitoring your consolidated solution.