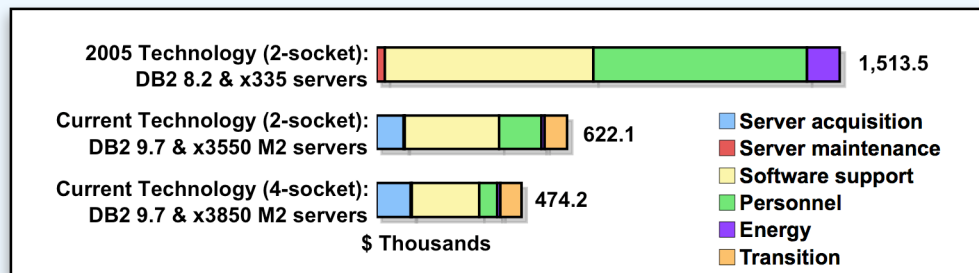


## VALUE PROPOSITION FOR MIGRATION: COST/BENEFIT CASE FOR IBM DB2 9.7 AND INTEL XEON PROCESSOR 5500 AND 7400 SERIES-BASED SERVERS

Use of IBM DB2 9.7 and latest-generation servers based on Intel Xeon 5500 series and 7400 series processors allows users to significantly reduce costs by consolidating earlier versions of IBM DB2.

Three-year costs for deployment of DB2 9.7 on IBM System x3550 M2 (Intel Xeon 5500 series-based) and x3850 M2 (Intel Xeon 7400 series-based) servers average 59 percent and 69 percent less respectively than for use of 2005 technologies.



Average consolidation ratios using DB2 9.7 are 6:1 for System x3550 M2 (2-socket) servers and 14:1 for System x3850 M2 (4-socket) servers.

Average payback periods are less than eight months for use of System x3550 M2, and less than seven months for use of System x3850 M2 servers.

### Consolidation Opportunities

At yearend 2004, the typical U.S. Fortune 500 corporation contained fewer than 300 server database instances. By the end of 2009, the number will have increased to more than 2,000. Similar trends have occurred in midsize business, in the public sector and in other types of organization worldwide. The fastest rates of growth have been among databases deployed on small x86 servers.

Multiplication of server databases has contributed to “server sprawl,” resulting in low levels of utilization, unnecessary duplication of resources, and inflation of system administration and facilities costs.

Although server consolidation has become pervasive, to date it has been more commonly applied to application and infrastructure servers, rather than database servers. Database consolidation has often raised complex performance issues, making it more difficult to plan for and prepare for initiatives.

One implication is that, in many organizations, the potential for database server consolidation has been little exploited. At a time of economic pressures, it is an obvious area of potential cost savings.

Key technology shifts have made consolidation increasingly viable. More powerful multicore processors, along with the growing sophistication of server and database platforms are creating new opportunities.

This report examines the cost savings that may be realized by upgrading and consolidating IBM DB2 databases. Three-year costs are compared for the following:

- **2005 technologies:** DB2 Version 8.2 is deployed on xSeries 335 two-socket servers with single-core Intel Xeon processors and the Windows Server 2003 operating system.
- **Current technologies:** DB2 Version 9.7 is deployed on (1) IBM System x3550 M2 two-socket servers with quad-core Intel Xeon 5500 processors, and (2) IBM System x3850 M2 four-socket servers with six-core Intel Xeon 7400 processors. The Windows 2008 operating system is employed on both System x platforms.

Savings are realized in a number of areas, including hardware maintenance, support for DB2 databases and Windows operating systems, and system administration and energy costs.

Calculations for DB2 9.7 deployed on System x3550 M2 and x3850 M2 servers allow for transition costs. These include acquisition and installation of new servers, along with database consolidation, staff retraining and related costs.

## Cost Comparisons

Comparisons are based on six installations with between 25 and 231 DB2 instances employed for a variety of applications in manufacturing, aerospace, government, IT services, insurance and financial services organizations.

Numbers of instances, servers and full time equivalent (FTE) system administration (sysadmin) personnel for use of 2005 technologies are based on user-supplied data. Although organizations employed a variety of two-socket x86 servers, installed bases were normalized to use of DB2 8.2 and IBM xSeries 335 server models for calculation purposes.

Scenarios were then developed for migration of DB2 instances to the latest DB2 Version 9.7 and consolidation of these to System x3550 M2 and x3850 M2 servers. Scenarios draw upon the experiences of more than 30 organizations that have conducted DB2 consolidation initiatives. They are consistent with “best practice” norms for the numbers of instances and workloads that may run on these platforms.

DB2 instances include mixes of DB2 Enterprise Edition and Workgroup Edition, while servers are configured with Enterprise and Standard Editions of Windows Server 2003 and (for Current Technologies scenarios) Windows Server 2008.

Software support costs include IBM Software Maintenance (SWMA) and Microsoft Software Assurance for DB2 and Windows Server licenses respectively. Hardware, maintenance and software support costs are calculated based on “street” prices; i.e., discounted prices paid by the organizations upon which installations are based.

Current Technologies scenarios do not include use of virtualization tools such as VMware and Microsoft Hyper-V. Although these may be employed to support multiple database instances, organizations that contributed to this report were able to achieve high levels of database consolidation without them.

Installations and scenarios are summarized below.

INDUSTRY	MANUFACTURING	AEROSPACE	GOVERNMENT
<b>Database instances</b>	25	53	78
<b>2005 Technologies</b> 2-socket, single core servers	17 x xSeries 335 2/2 x Xeon 3.2 GHz 0.8 sysadmin FTE	33 x xSeries 335 2/2 x Xeon 3.2 GHz 1.3 sysadmin FTEs	49 x xSeries 335 2/2 x Xeon 3.2 GHz 1.75 sysadmin FTEs
<b>Current Technologies #1</b> 2-socket, quad-core servers	4 x System x3550 M2 2/8 x Xeon 2.93 GHz 0.2 sysadmin FTE	5 x System x3550 M2 2/8 x Xeon 2.93 GHz 0.25 sysadmin FTE	6 x System x3550 M2 2/8 x Xeon 2.93 GHz 0.45 sysadmin FTE
<b>Server Consolidation Ratio</b>	4.25:1	6.6:1	8.2:1
<b>Current Technologies #2</b> 4-socket, six-core servers	2 x System x3850 M2 4/24 x Xeon 2.67 GHz 0.1 sysadmin FTE	2 x System x3850 M2 4/24 x Xeon 2.67 GHz 0.1 sysadmin FTE	4 x System x3850 M2 4/24 x Xeon 2.67 GHz 0.2 sysadmin FTE
<b>Server Consolidation Ratio</b>	8.5:1	16.5:1	12.25:1
INDUSTRY	IT SERVICES	INSURANCE	FINANCIAL
<b>Database instances</b>	125	182	231
<b>2005 Technologies</b> 2-socket, single-core servers	64 x xSeries 335 2/2 x Xeon 3.2 GHz 1.65 sysadmin FTE	73 x xSeries 335 2/2 x Xeon 3.2 GHz 2.5 sysadmin FTEs	167 x xSeries 335 2/2 x Xeon 3.2 GHz 5.0 sysadmin FTEs
<b>Current Technologies #1</b> 2-socket, quad-core servers	13 x System x3550 M2 2/8 x Xeon 2.93 GHz 0.35 sysadmin FTE	17 x System x3550 M2 2/8 x Xeon 2.93 GHz 0.6 sysadmin FTE	24 x System x3550 M2 2/8 x Xeon 2.93 GHz 0.7 sysadmin FTE
<b>Server Consolidation Ratio</b>	4.9:1	4.3:1	7:1
<b>Current Technologies #2</b> 4-socket, six-core servers	6 x System x3850 M2 4/24 x Xeon 2.67 GHz 0.2 sysadmin FTE	7 x System x3850 M2 4/24 x Xeon 2.67 GHz 0.25 sysadmin FTE	8 x System x3850 M2 4/24 x Xeon 2.67 GHz 0.25 sysadmin FTE
<b>Server Consolidation Ratio</b>	10.7:1	10.4:1	20.9:1

In this presentation, numbers of processors and cores for servers are shown; e.g., “2/2 x Xeon 3.2 GHz” refers to a server with two single-core Intel Xeon 3.2 GHz processors.

## Cost Factors

To some extent, lower costs for Current Technologies scenarios are due to gains that are typically achieved through server consolidation. Fewer physical servers mean reduced hardware maintenance, energy and system administration costs, while fewer software copies translate into lower support costs.

Two other factors also contribute to cost savings. These are:

1. **DB2 9.7 capabilities.** Compression of database tables (introduced in DB2 Version 9.1 in 2006), and of indexes, temporary tablespaces and other data structures (added in DB2 Version 9.7 in April 2009) has enabled users to achieve overall data compression rates of 60 to 80 percent.

DB2 9.7 data compression has reduced demands for disk and tape storage capacity by wide margins. The savings potential of this effect is not addressed in this report, although it has proved to be substantial.

DB2 9.7 data compression also improves server performance – routinely by 20 to 30 percent – and enables higher levels of utilization for processors, memory and I/O. In migrating from earlier platforms to System x3550 M2 and x3850 M2 models, organizations thus experience performance gains that are larger than differences in “raw” server power would suggest.

Capacity utilization is further improved by workload management and performance optimization capabilities built into DB2 9.7. These are more advanced than their DB2 8.2 counterparts, and implement higher levels of automation; i.e., less intervention by administrators is required.

These capabilities have proved particularly effective in managing mixed workloads, making DB2 9.7 particularly valuable for organizations consolidating diverse databases.

DB2 9.7 features a variety of other functional enhancements, including industry-leading support for XML technologies, which may improve application functionality, quality of service and cost structures for database administration, development and other functions.

IBM also offers an extensive suite of tools and services that have been successfully used to migrate other databases to DB2 9.7.

2. ***System x capabilities.*** System x3550 M2 and x3850 M2 servers both implement IBM X Architecture. This is an Intel Xeon processor-based design, currently in its fourth generation, that enables servers to scale in a manner that maximizes the performance of memory and I/O as well as processors. The design is based in part upon IBM mainframe architecture.

X Architecture is built around a customized Intel Xeon processor-based chipset that incorporates multiple embedded performance accelerators. These include a 324-megabyte (MB) “snoop” filter that increases multiprocessing efficiency (standard Intel designs support only up to 64 MB), a large Level 4 cache (standard Intel designs support only Levels 1 to 3) and Advanced Buffer eXecution (ABX) technology that reduces buffer latency.

X Architecture materially facilitates database consolidation not only by accelerating system-level performance, but also by reducing risks that memory and I/O bottlenecks will occur when multiple database workloads run on the same physical server.

Additional workload management capabilities are provided by IBM Systems Director, a no-charge system management suite offered by IBM for System x servers; and a related product, IBM Active Energy Manager software, provides extensive energy management features that may significantly reduce electricity consumption.

System x3550 M2 and x3850 M2 servers in Current Technologies scenarios are configured with Systems Director and Active Energy Manager. xSeries 335 servers are configured with the earlier, more limited IBM Director product.

DB2 9.7 and latest-generation System x servers are also equipped with extensive features designed to minimize unplanned outages as well as to reduce both the frequency and duration of planned outages.

Avoidance of the effects of system downtime, which may be measured in terms of lost productivity, operational disruption and other variables, may also deliver important bottom-line benefits.

## Conclusions

Two key conclusions emerge.

One is that, for DB2 users, migration to DB2 9.7 and consolidation of database instances onto latest-generation System x servers offers the potential not only for significant cost savings over time, but also for rapid payback.

These gains may be realized with comparatively small upfront expenditures. If appropriate vendor support agreements are in place, existing database and server operating system licenses may be transferred. Initial costs are for server acquisition and transition only.

The ability to consolidate database instances without use of VMware, Hyper-V or equivalent virtualization tools increases savings. Organizations may avoid license and support costs for VMware, and are not subject to limitations on the number of instances that may be supported without incurring additional fees. Implementation and training costs and complexities are also reduced.

The second conclusion is that, to maximize consolidation gains, it is not sufficient simply to employ more servers equipped with more powerful processors. DB2 9.7 and X-Architecture servers offer potentials for higher system-level performance, more effective management of mixed workloads and greater resiliency than if less sophisticated platforms are employed.

From this perspective, the capabilities of latest-generation Intel processors, DB2 9.7 and X-Architecture servers are highly synergistic. They offer a combination of power and functionality that maps directly to the core requirements for database server consolidation in organizations of all types and sizes.

## Additional Information

This ITG Status Report is based upon the preliminary results and methodology for an upcoming Management Brief to be released by the International Technology Group. For copies of this Management Brief, please email requests to [info-itg@pacbell.net](mailto:info-itg@pacbell.net).



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