



The IBM @server i5 Three-in-One Benchmark

New POWER5 processor-based servers from IBM demonstrate outstanding performance and resiliency in real-world small and medium business scenarios

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Introduction

Although many benchmarks deliver valuable information about the high-watermark capabilities of server platforms that are finely-tuned to run a single application, very few benchmarks accurately represent the realistic IT environments of today's small and medium businesses. For this reason, IBM developed a new benchmark – the Three-in-One benchmark – to mirror the real-world requirements and demands facing these companies.

Conducted on an IBM @server i5 520 – the latest member of the IBM @server iSeries product line based on innovative POWER5 technology – this benchmark was designed to showcase the unique ability of the model 520 server to run multiple applications under typical, everyday stresses without compromising performance, usability or resilience. Given the integrated nature of the IBM @server i5 product line and the IBM i5/OS operating system (the latest generation of IBM OS/400), the performance conclusions should also apply to other IBM @server i5 servers.

The results of this benchmark demonstrate that, by running multiple applications on a single IBM @server i5 server, businesses can effectively exploit the full capacity of their IT infrastructures – helping to increase return on investment (ROI) and manageability. In addition, IBM @server i5 servers can enable you to:

- *Successfully run the server out of the box, without conducting expensive fine-tuning or special customisation*
- *Achieve subsecond response times and predictable performance for multiple applications running simultaneously, even during fluctuations in demand*
- *Dynamically handle unexpected opportunities and demands without adding or upgrading servers.*

Highlights

As the industry's first servers based on IBM POWER5 processors – the ninth generation of IBM 64-bit processor technology – IBM @server i5 servers can enable companies to seamlessly upgrade their processing power while continuing to use their investments in storage and networking infrastructure.

The proven, open and flexible design of POWER processors builds on the iSeries tradition of integration, virtualization and outstanding systems management to bring new levels of functionality and simplicity to today's on demand world.

Behind all these remarkable capabilities is the unique IBM @server i5 integrated architecture. Some server architectures cannot efficiently manage multiple applications in this manner and often use only a small percentage of their total capacity,¹ forcing businesses to add new servers as well as cost and complexity every time a business or application requires changes. To help address this issue, IBM @server i5 servers feature subsystem management capabilities that automatically allocate resources to applications as needed, thereby facilitating highly efficient utilisation of system resources.

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Benchmark results help demonstrate business benefits

As its name suggests, the Three-in-One benchmark employs three typical (yet diverse) applications running simultaneously on a single IBM @server i5 520 server. This server is designed to help businesses reduce complexity, simplify their IT infrastructures and reduce their total cost of ownership (TCO). It supports multiple operating systems and application environments concurrently to allow companies to deploy new applications and consolidate operations on a single, highly flexible, resilient server with outstanding price/performance.

To approximate the IT environments representative of small and medium organisations, the benchmark used conditions that represent typical, real-world business scenarios. All applications were installed on a single server

Highlights

During the test, security settings were appropriate for the secure Web transactions and the heightened system security most businesses use today – not the minimal or nonexistent security settings that produce the maximised performance figures found in some benchmarks.

The results of the Three-in-One benchmark demonstrate the unique ability of IBM @server i5 servers to support a wide variety of applications simultaneously while providing excellent performance for all of them. These results can help your business achieve – reduced TCO, high ROI, fast deployment and outstanding customer service.

using default, out-of-the-box operating system parameters – not the special tuning techniques typically used in benchmark testing. During the test, security settings were appropriate for the secure Web transactions and the heightened system security most businesses use today – not the minimal or nonexistent security settings that produce the maximised performance figures found in some benchmarks.

The results of the Three-in-One benchmark demonstrate the unique ability of IBM @server i5 servers to support a wide variety of applications simultaneously while providing excellent performance for all of them – in a realistic, attainable environment for a small or medium company. What can these results mean to your business?

- **Reduced TCO**

A single IBM @server i5 server can support a range of applications, both old and new, without the management hassle of a server farm – with far less complexity and lower TCO

- **High ROI and on demand readiness**

The scalability and flexibility of IBM @server i5 servers can help companies achieve outstanding ROI while also helping them to compete effectively in the rapidly changing world of e-business on demand

- **Fast deployment**

The easy-to-use, turnkey functionality of these servers can help businesses quickly deploy applications while taking advantage of existing IT and application skills

- **Outstanding customer service and increased revenue**

IBM @server i5 server performance and subsecond response times can promote excellent employee productivity, high transaction volume and improved customer service through reduced wait times.

Highlights

The benchmark used three application environments, each representing a different business application that a small or medium business would typically run today: online transaction processing (OLTP), collaboration and secure Web serving.

The OLTP application was PeopleSoft World – used by thousands of iSeries customers every day to manage their businesses.

Multiple application environments approximate real-world systems

The benchmark used three application environments, each representing a different business application that a small or medium business would typically run today: online transaction processing (OLTP), collaboration and secure Web serving.

- **OLTP: A real-world order-entry scenario**

PeopleSoft World (formerly known as J.D. Edwards WorldSoftware) is a host-centric, RPG-based product being used by thousands of iSeries customers every day to manage their businesses. The OLTP portion of the Three-in-One benchmark was driven using 16 LoadRunner scripts that simulated users for three PeopleSoft World processing categories: financial, distribution and manufacturing. User types simulated for the financial category included Accounts Payable Clerk, Cash Receipts Clerk and General Ledger Clerk. User types for the distribution category included Inventory Clerk, Purchasing Order Processing Clerk (Inventory) and Sales Order Processing Clerk. The user types for the manufacturing category included a Bill of Materials Processing Clerk.

This OLTP test used the A7.3 Cumulative Update 15 version of PeopleSoft World, which became generally available on March 31, 2004.



Highlights

The benchmark tested Web-based e-mail and instant messaging that represents a typical, secure, small and medium business implementation.

A Web-based product selection and product payment application, including the secure transactions required by most businesses today, was tested.

- **Collaboration using IBM Lotus software: A real-world scenario for e-mail, calendaring and instant messaging**
As travel budgets decrease and businesses continue to become global, collaborative processing among employees, suppliers and customers through e-mail and instant messaging becomes an increasingly crucial business application area for many organisations. To represent these applications, the Three-in-One benchmark included Web-based e-mail using Lotus Domino Web Access V6.5.1 and instant messaging using Lotus Instant Messaging. Users accessed 16MB e-mail databases and sent and received instant messages to a 50-person buddy list.
- **Secure Web serving with IBM WebSphere Application Server: A real-world Web transaction scenario**
Many companies are interested in making business processes directly available to customers, employees and suppliers through secure e-business Web services. To simulate this type of processing, the Three-in-One benchmark used IBM WebSphere Application Server V5.1 to run a direct, public, Web-based product selection application that also included secured product payments.

To simulate Web-serving processes, the benchmark employed Trade3, an application designed to measure aspects of Web-serving scalability, performance and competitiveness. The application is a collection of Java classes, Java servlets, Java Server Pages and Enterprise JavaBeans, which together form an application providing simulated brokerage services.

Highlights

The Three-in-One benchmark test focused on three critical scenarios that affect most businesses today.

Testing demonstrates performance and resilience of IBM @server i5 servers

To reconstruct a variety of circumstances typical to many businesses today, the testing team explored several business scenarios:

- **A base scenario**
In this scenario, all applications were run both individually and simultaneously to demonstrate the effects of concurrent operation on application response times
- **A Web-serving stress-test scenario**
This scenario tested application response times under a heavy, secure Web-serving load with core business applications running simultaneously
- **A growth scenario**
This scenario tested application response times as the processing demand for each application increased and total central processing unit (CPU) utilisation exceeded 97 percent.



Highlights

The base scenario tested three applications – running simultaneously – driven to their normal daily production limits.

The base scenario illustrates normal performance

To simulate a real-world data processing environment comprised of OLTP, collaboration and secure Web-serving applications, the base scenario tested three applications driven to their normal daily production limits. Figure 1 shows the results for running the three applications individually.

Application	Average CPU utilisation (percent)	Average response time (seconds)	Number of users or throughput
PeopleSoft World	2.4	0.063	200 users
Domino Web Access and Lotus Instant Messaging	11.7	0.068 0.012	200 users 200 users
Trade3	55.9	0.089	25.2 transactions/second

Figure 1. Base scenario: Running the three benchmark applications individually



Highlights

With all three applications running simultaneously, the IBM @server i5 520 delivered dramatic, subsecond response time. These results demonstrate the impressive capability of the @server i5 to support multiple, highly disparate applications while providing excellent response times. Such results are rarely, if ever, achieved on a single server.

What can these results mean for your business? Your customers, employees and suppliers can access the information they need, when they need it – without requiring your organisation to purchase new servers every time business demand changes.

Application	Average CPU utilisation (percent)	Average response time (seconds)	Number of users or throughput
PeopleSoft World	2.7	0.079	200 users
Domino Web Access and Lotus Instant Messaging	13.6	0.096 0.012	200 users 200 users
Trade3	56.7	0.141	25.1 transactions/second
All workloads concurrently	73.0		

Figure 2. Base scenario: Running the three benchmark applications simultaneously

As shown in Figures 1 and 2, average response times were only slightly longer – but still subsecond – when all applications ran together. These results demonstrate the impressive capability of the IBM @server i5 520 to support multiple, highly disparate applications while providing excellent response times and throughput capability for all three applications – straight out of the box, without requiring special performance tuning. Such results are rarely, if ever, achieved on a single server, and can require great expense to reproduce in a server-farm environment.

What do these results mean for your business? IBM @server i5 servers can help you efficiently and effectively add new applications and run core business applications without significantly affecting performance for end users. In this manner, your customers, employees and suppliers can access the information they need, when they need it – without requiring your organisation to purchase new servers to scale up.

Highlights

The Three-in-One benchmark included a secure Web-serving stress-test designed to simulate unpredictable peaks in business demand.

The Web-serving stress-test scenario simulates peaks in demand

To simulate real-world circumstances in which Web-serving loads increase dramatically (for example, in response to a sales promotion), the Three-in-One benchmark tested a secure Web-serving stress-test scenario. To begin, all three applications were run concurrently. Then, secure Web transactions were increased by approximately 50 percent to simulate peak processing demand. The results of this test are summarised in Figure 3.

	Average CPU utilisation (percent)	Average response time (seconds)	Number of users or throughput
PeopleSoft World	2.7	0.081	200 users
Domino Web Access and Lotus Instant Messaging	13.6	0.093 0.011	200 users 200 users
Trade3	50.0	0.115	22.4 transactions/second
Steady state prior to stress load	66.3		
PeopleSoft World	2.9	0.081	200 users
Domino Web Access and Lotus Instant Messaging	13.7	0.234 0.011	200 users 200 users
Trade3	78.8	0.720	32.4 transactions/second
Steady state during stress load	95.4		

Figure 3. Web-serving stress-test scenario

Highlights

This benchmark underscores the superior capability of the IBM @server i5 server to deliver consistent subsecond response times even during periods of extremely high Web-serving demands. Because @server i5 servers can support multiple application environments simultaneously, dynamically doubling the work of one application need not adversely affect other applications.

Using IBM @server i5 servers, your business can prepare for unpredictable increases in business demand while enjoying consistently high response times.

As the results in Figure 3 indicate, even under severe Web-serving load conditions, response times for all application environments remained well under one second. This benchmark underscores the superior capability of the IBM @server i5 520 server to deliver consistently solid, subsecond response times even during periods of extremely high Web-serving demands. Because IBM @server i5 servers can support multiple application environments simultaneously, dynamically doubling the work of one application need not adversely affect other applications – helping each application continue to operate at peak efficiency regardless of variations in customer, partner or employee demand.

Using IBM @server i5 servers, your business can prepare for unpredictable increases in business demand while enjoying consistently high response times. In addition, these servers can help provide the high service levels your customers expect.



Highlights

The growth scenario was designed to simulate how a typical business grows over time. Even as the number of users was increased by 50 percent, each application maintained excellent, subsecond response times even when the average utilisation of the system surpassed 97 percent.

The growth scenario demonstrates scalability

Finally, to simulate the transaction loads typical of a growing business, the Three-in-One benchmark increased transaction demand for each of the three applications. In this growth scenario, average system CPU utilisation exceeded 97 percent.

	Average CPU utilisation (percent)	Average response time (seconds)	Number of users or throughput
PeopleSoft World	2.7	0.079	200 users
Domino Web Access and Lotus Instant Messaging	13.6	0.096 0.012	200 users 200 users
Trade3	56.7	0.141	25.1 transactions/second
Base scenario (data included for reference)	73.0		
PeopleSoft World	4.4	0.086	300 users
Domino Web Access and Lotus Instant Messaging	19.2	0.399 0.012	300 users 300 users
Trade3	73.5	0.961	30.5 transactions/second
Growth scenario	97.1		

Figure 4. Growth scenario

As indicated in Figure 4, each application maintained excellent, subsecond response times even when the average utilisation of the system surpassed 97 percent. This scenario demonstrates the capability of IBM @server i5 servers to sustain outstanding performance as overall demand increases – in much the same way that a typical business grows over time.

Highlights

In today's innovative, on demand environment, businesses need their servers to support a broad array of applications and deliver near-linear scaling while maintaining subsecond response times. During the benchmark growth scenario, the 520 demonstrated just this type of near-linear, predictable growth capability. For this reason, customers can be confident that as their business and application demands expand, the @server i5 can help deliver fast, reliable response times they can count on.

The extraordinary IBM @server i5 server can help customers achieve extraordinary business results.

Any server will eventually become overwhelmed if application demands exceed its capacity; however, as application requirements increase or become more complex, businesses should expect their servers to deliver near-linear scaling while maintaining subsecond response times. During the benchmark growth scenario, the 520 demonstrated just this type of near-linear, predictable growth capability. For this reason, IBM @server i5 customers can be confident that as their business and application demands expand, the 520 can help deliver fast, reliable response times they can count on.

Businesses can achieve extraordinary results from an extraordinary server

In this age of technological advancement, no small or medium business should have to compromise peak performance in order to run multiple, secure applications on a single server – nor should companies trade the performance of one application for the ability to accommodate the fluctuating demands of another.

Highlights

The Three-in-One benchmark demonstrates the power of integrated IBM @server i5 architecture to simultaneously manage multiple, vastly different application environments while maintaining subsecond response times and consistent system performance.

In addition, the Three-in-One benchmark demonstrates the ability of the i5/OS operating system to help deliver subsecond response times even when application demands are substantially increased, exceeding 95 percent CPU utilisation. Because the server used in the benchmark was configured with default system settings, these tests also illustrate that customers need not perform extensive performance tuning or accept reduced security to maintain high performance during peak or mixed application periods.

The Three-in-One benchmark demonstrates the power of integrated IBM @server i5 architecture to simultaneously manage multiple, vastly different application environments while maintaining subsecond response times and consistent system performance. Because the applications selected for the benchmark – PeopleSoft World, Domino Web Access, Lotus Instant Messaging and WebSphere Application Server – represent popular applications in use by many IBM customers today, these results show that small and medium businesses can rely on IBM @server i5 servers to run the applications they need without worrying about performance, security and reliability.

In addition, the Three-in-One benchmark demonstrates the ability of the i5/OS operating system to help deliver subsecond response times even when application demands are substantially increased, exceeding 95 percent CPU utilisation. Because the server used in the benchmark was configured with default system settings, these tests also illustrate that customers need not perform extensive performance tuning or accept reduced security to maintain high performance during peak or mixed application periods. Complete with integrated e-business tools as well as database, storage and self-healing capabilities, IBM @server i5 servers can help your business truly achieve e-business on demand.

For more detailed information or to read the complete Three-in-One benchmark technical report, please visit:

ibm.com/eserver/series/hardware/threeinone



IBM United Kingdom Limited

emea marketing and publishing services
(emaps)
Normandy House
PO Box 32
Bunnian Place
Basingstoke
RG21 7EJ
United Kingdom

The IBM home page can be found at
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¹ Source: Solitaire Interglobal, 'Query Response: What is the average utilisation of Wintel servers and how does this affect the efficient deployment of these platforms?' November 2003. Available at: www.sil-usa.com/Papers/QueryResponses/QUERY_RESPONSE_20031575.pdf.

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