

## The Benefits of Running SAP Solutions on IBM eX5 Systems



# Redpaper

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International Technical Support Organization

#### The Benefits of Running SAP Solutions on IBM eX5 Systems

August 2010

Note: Before using this information and the product it supports, read the information in "Notices" on page v.

#### First Edition (August 2010)

This edition applies to products from SAP that run on IBM System x and BladeCenter servers.

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### Preface

SAP is the maker of one of the world's most popular inter-enterprise software suites. It provides collaborative business solutions for all types of industries. The company's flagship offering is the SAP Business Suite, which includes solutions for enterprise resource planning (ERP), customer relationship management (CRM), product life cycle management (PLM), and supply chain management (SCM).

This IBM® Redpaper<sup>™</sup> describes the benefits of running SAP on the IBM System x® and IBM BladeCenter® platforms, including the IBM eX5 flagship systems, the x3850 X5 and BladeCenter HX5. We first introduce the SAP offerings, then we explain the processes involved in correctly sizing an SAP platform and the tools and resources available to make the best decisions. We also review the hardware offerings from IBM both for systems and for storage and networking. We also describe suitable hardware solutions. Finally, we discuss the advantages of using IBM high-performance platforms for running SAP solutions.

This paper is for SAP administrators and technical solution architects. It is also for business partners and IBM employees that want to know more about SAP offerings and available IBM solutions for SAP customers.

#### The team who wrote this Redpaper

This Redpaper was produced by a team of specialists from around the world working at the International Technical Support Organization, Poughkeepsie Center.

**Gereon Vey** is a member of the IBM System x Team at the IBM SAP International Competence Center (ISICC) in Walldorf, Germany, since 2004. His activities include the maintenance of sizing guidelines and capacity data for System x servers and pre-sales support for IBM worldwide. He answers InfoService requests for System x and BladeCenter. Prior to working at the ISICC, Gereon worked on behalf of IBM with SAP to port SAP to System i®. He has worked in the IT industry since 1992 and graduated with a degree Computer Science from the University of Applied Sciences in Worms, Germany, in 1999.

**David Watts** is a Consulting IT Specialist at the IBM ITSO Center in Raleigh. He manages residencies and produces IBM Redbooks® publications on hardware and software topics related to IBM System x and BladeCenter servers and associated client platforms. He has authored over 80 books, papers, and web docs. He holds a Bachelor of Engineering degree from the University of Queensland (Australia) and has worked for IBM both in the US and Australia since 1989. David is an IBM Certified IT Specialist and a member of the IT Specialist Certification Review Board.



The team (I-r): David and Gereon

Thanks to the following people for their contributions to this project:

From the International Technical Support Organization

- ► Linda Robinson
- Erica Wazewski

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- ► Gereon Vey
- David Watts

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## 1

## **Introduction to SAP**

This chapter describes SAP as an organization, its core business offerings, and its areas of strength.

The topics covered in this chapter are as follows:

- ► 1.1, "The client-server concept" on page 2
- ▶ 1.2, "A brief introduction to SAP" on page 2
- ▶ 1.3, "SAP architecture" on page 3
- ▶ 1.4, "SAP and IBM System x: A key relationship" on page 16

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#### 1.1 The client-server concept

The concept of the *client-server model* has several uses but all are based around using a client system to access a centralized server to use a service. When a network application is described as being *client-server*, we mean that the application runs a service on a server and a client version of the application is used to access the service.

The term *client-server network* is one where a centralized server provides network services to other clients in the network. Such a network is described as a domain in Linux®, Macintosh, UNIX®, and Windows® operating systems.

Sometimes a server is used to centralize resources that are shared by a number of users. For instance, file servers centralize file storage, database servers centralize data storage, and web servers centralize the distribution of web content.

#### 1.2 A brief introduction to SAP

SAP was started in 1972 by five former IBM employees in Mannheim, Germany. They launched SAP AG to turn the real business processing vision into reality. SAP AG is one of the world's largest inter-enterprise software organizations and a leading independent software supplier. SAP stands for *Systeme, Anwendungen, Produkte in der Datenverarbeitung* which, translated to English, means *Systems, Applications, Products in Data Processing*.

The first software produced by SAP AG was called the R/1 system. The "R" stands for real time data processing.

At the end of the 1970s, this was replaced by R/2, a mainframe-based software designed to handle many languages and currencies. This product was especially successful in multinational European companies.

In the 1990s, SAP R/3 started to have success in the market, using the client-server concept, uniform appearance of graphical interfaces, consistent use of relational databases, and the ability to run on systems from multiple vendors. The client-server concept introduced at this time meant that the processing of an application could be split between the server and the client workstation: the server handled the centralized functions, while the client workstation handled the user interface functions. The data management was separate from the server.

In 1992, SAP AG introduced R/3, a client server ERP software that runs in multiple platforms, including UNIX and Microsoft® Windows.

SAP has helped customers structure their business operations by integrating their business processes. They have achieved this using an enterprise resource planning (ERP) software offering. The ERP system allows the exchange of data and information between various business units (such as finance, human resources, and logistics) of an organization.

SAP R/3 is an integrated tool to replace an obsolete and inefficient IT Infrastructure. Initially companies had departmental IT infrastructures to meet their automation requirements. Each department had its own policies, interfaces, and related IT infrastructure. Over time and through experience, a consolidated approach to link interfaces was developed. SAP is an integrated approach to such interfaces.

SAP enables business process change through its process best practices. It drives the organization towards process orientation to achieve higher productivity standards and reduce production and labor costs.

SAP offers the following characteristics, which makes it one of the leading ERP applications across the globe:

- Platform independence
- Integration and support of a wide range of business solutions
- Support of multiple clients
- Flexibility of customization to meet customer requirements
- Scalability to grow to unlimited users
- Resources to extend best practices to entire value chain
- IT investment protection with programs such as Safe Passage for customers running other ERP solutions.

#### 1.3 SAP architecture

SAP offers a complete range of enterprise software applications and business solutions to drive businesses ranging from enterprise to small. It offers these business applications and solutions to handle every aspect of the business. The Windows and Linux markets are important to SAP, and System x is an ideal platform on which to run SAP solutions.

The SAP NetWeaver solution map (Figure 1-1) highlights various IT processes supported by solutions from SAP and its partners.

User Productivity Enablement	Running an Enterprise Portal	Enal Us Collab	bling ser oration	Bu Man	siness Task agement	Mobili Busin Proces	zing ess sses	Ente Know Manag	rprise /ledge gement	Enterprise Search
Data Unification	Master-Data Harmonizatio	a >n	M Co	aster-D nsolida	ata ition	Central Man	Master lageme	-Data nt	En W	terprise Data /arehousing
Business Information Management	Enterprise Reporting, Query and Analysis	Bus , ai	iness Pla nd Analyt Services	inning ical s	Enterpri Wareh	ise Data ousing	E Kı Ma	nterprise nowledge inagemei	e nt	Enterprise Search
Business Event Management	Busine	ss Activ	ity Monit	oring			Busir	iess Tasl	c Manaç	jement
End-to-End Process Integration	Enabling Applicatio to-Application Processes	n- Enal	bling Bus to-Busine Processe	iness- ss s	Business Manaç	s Process gement	Enab Inte	ling Platf roperabil	orm ity	Business Task Management
Custom Development	Developing,	Config Applic	uring, and ations	d Adapt	ing	E	nabling	) Platforr	n Intero	perability
Unified Life-Cycle Management	Software	Life-Cy	cle Mana	igemen	t		SAP N	letWeave	∍r⁰ Ope	rations
Application Governance and Security Management	Authentic	ation an	nd Single S	Sign-O	n	Inteç	grated L	lser and <i>l</i>	Access I	Vlanagement
Consolidation	Enabling Platforn Interoperability	n SA	P NetWe Operatio	aver ns	Maste Conso	or-Data lidation	Ei Know	nterprise ledge Mç	jmt.	Enterprise Data Warehousing

Figure 1-1 SAP NetWeaver solution map

The SAP IT practices are identified by SAP as ways to map business requirements to specific IT projects as a means of bringing order to the existing infrastructure. This is described in Table 1-1.

Table 1-1 IT Practices with SAP NetWeaver

Activity	Benefit
User productivity enablement	Help users and groups improve their productivity through enhanced collaboration, optimized knowledge management, and personalized access to critical applications and data.
Data unification	Consolidate, rationalize, synchronize, and manage master data for improved business processes.
Business information management	Increase the viability, reach, and usefulness of structured and unstructured enterprise data.
Business event management	Ensure that business events from multiple systems are distributed to the appropriate decision makers in the context of relevant business processes.
End-to-end process integration	Make disparate applications and systems work together consistently to perform business processes.
Custom development	Rapidly create new enterprise-scale applications that drive your company's differential advantage.
Unified life-cycle management	Automate application management and processes to optimize an application's life cycle.
Application governance and security management	Maintain an appropriate level of security and quality in your intellectual property and information assets.
Consolidation	Deploy a consolidated technology platform with the ability to allocate computing power according to changing business needs.
Enterprise SOA design and deployment	Consolidate and standardize your basic processes and use existing investments to compose new distinctive business processes.

#### 1.3.1 SAP environment architecture

An SAP system consists of *SAP instances*. An SAP instance is a group of processes that are started and stopped at the same time. These instances are as follows:

Central instance

Each SAP system has at least one central list that has the following components:

- Usage type AS ABAP
  - Dispatcher
  - Work processes (dialog, batch, spool, or update)
  - Gateway
  - Internet Communication Manager (ICM)
  - Internet Graphics Service (IGS)
- Usage type AS Java<sup>™</sup>
  - Java dispatcher
  - Server processes
  - Software Deployment Manager (SDM)
  - Internet Graphics Service (IGS)

Central services instance

In this instance, we have the Java central services instance (SCS) or ABAP central services instance (ASCS),. These instances forms the basis of communication and synchronization for the Java or ABAP clusters. This instance consists of the message server and the enqueue server.

Database instance

This instance is a mandatory installation component for the installation of an SAP system

Dialog instance

This optional instance is used to add more resources in an SAP System and must be installed in an additional server. This concept is explained in detail in Chapter 2, "Sizing" on page 19.

In an SAP environment, we can use a 2-tier (central instance) or a 3-tier landscape (central instance with one or more dialog instances).

Most SAP customers implement a 2-tier client-server architecture:

- ► The presentation layer provides an interface to the user
- ► The application and database layer operates and hosts the business process

The Internet capability of SAP allows it to be structured as a multi-tier architecture, as shown in Figure 1-2.



Figure 1-2 Various software layers of SAP ERP (© SAP AG 2007, 2010. All rights reserved.)

These layers can be classified as follows:

Presentation layer

This layer provides the user with an SAP graphical user interface, commonly referred to as SAPGUI. Because SAP offers an Internet-based interface as well, it is important to understand that it can achieve minimum bandwidth consumption by using the TCP/IP protocol.

Application layer

The application layer processes the user transactions and performs other functions (such as application interface, print server, and database access).

Internet layer

In case of a multi-tier architecture, this layer provides the user with a web interface for browser access to business applications.

Database layer

The database layer is used for storing the SAP data generated by businesses and the SAP application programs, which are used by the database from the SAP application servers at run time. An organization has the flexibility to choose the database of its choice (including SQL, Oracle, DB2®, and so forth).

As shown in Figure 1-2 on page 5, the 2-tier architecture can have a presentation layer and a consolidated hardware server for application and database. A typical 3-tier architecture consists of presentation hardware, single or multiple application servers for load sharing and scalability, and usually a single database or production server. The multi-tier architecture deploys a web-based presentation layer, an Internet server, multiple application servers, and a centralized database server.

A SAP implementation project is implemented in a phased manner. It requires different types of systems during different phases to execute the project. It typically requires training the users and understanding the customer's business process, customizing their SAP application, testing the customized application, and porting to the production server.

The following servers are generally required to execute a project:

Development server

This server is required to customize the application to meet the business process requirements of the customer. Because the workload on such servers is minimal, a low-end hardware server meets the requirement.

Test and Quality Assurance (QA) server

SAP applications, customized on the development server, are usually tested on this server before moving them to the production environment. A sample database from the prospective customer is used to test the performance of SAP in a production environment. The testing and QA involves the upgrades related to the operating system, database software, hardware or firmware updates, and SAP patches, and so forth. Because the systems require testing, the sample database is in a real time environment. The hardware requirement is slightly higher than that of a development server.

Training server

This server is used to provide training to the customer's users and is used for testing any customer specific requirements. Because the server is only used to provide training to the users without any load factor, the hardware requirements are generally not significant.

Application server

All programs related to the SAP application are hosted on the SAP application servers. Depending on the workload and scalability factor, there can be multiple application servers or a single application server. Because the application server typically provides a program file's access to the users, its hardware requirement can be fulfilled using a moderate configuration.

Database or production server

The live production database of the customer is handled by the production server. This server handles the highest load factor in a production environment. The requirement is of a high configuration, which can be scaled further. Because they are critical, these servers need to be regularly backed up and to have a high level of built-in redundancy. For a large enterprise, a scalable external storage appliance to store the data to meet ever growing database requirements is ideal.

SAP Solution Manager

This product provides facilities in technical support for distributed systems with functionality that covers all key aspects of solution deployment, operation, and continuous improvement.

Organizations have differing requirements. Therefore, considering these requirements, they can plan the architecture that suits them best. SAP sizing tools, described in Chapter 2, "Sizing" on page 19, help an organization decide on the architecture to implement.

An ideal scenario is to have either a multi-tier infrastructure or, at least, a 3-tier architecture. However, combinations can be selected that consider various factors, such as future growth, workload factor, and budget. It is quite common to find a single server used for development and testing. Similarly, quite a few environments use a common server for application and database, thereby making it a 2-tier environment

#### 1.3.2 Enterprise applications

This section discusses the range of SAP enterprise solutions that apply to varying sizes of businesses.

#### **SAP Business Suite**

The SAP Business Suite offers organizations a choice of integrating their business units using the complete business suite or using various modules separately. SAP Business Suite supplements the SAP R/3 with enhanced features and offerings:

- ► Targeted for enterprise businesses with more than 1000 employees
- Offers comprehensive modules for complete integration of business units
- Unlimited scalability factor ensures protected investment
- ► Easy collaboration over the Internet provides electronic handling of business processes.
- ► Flexibility to use separate modules or completely integrated business suite.

#### SAP Customer Relationship Management (CRM)

In an environment where many companies have lost sight of the real meaning of customer relationship management (CRM), it is critical to remember what CRM is about. It is about acquiring and retaining customers, improving customer loyalty, gaining customer insight, and implementing customer-focused strategies.

#### SAP Enterprise Resource Planning (ERP)

SAP ERP addresses the core business software requirements of the most demanding midsize and large organizations - in all industries and sectors.

The SAP ERP solution, built on R/3, is an ERP solution offering complete integration for the core business applications of midsize and large organizations. It is an analytical tool that helps customers with business decisions. It provides the capability to manage financial databases, assets, cost accounting, production operations, and corporate services of an organization. The SAP ERP solution runs on a number of platforms including Windows servers and databases (covered in Chapter 3, "Hardware and software considerations" on page 25).

SAP ERP uses the client-server model and provides the ability to store, retrieve, analyze, and process corporate data in many ways for financial analysis, production operation, human resource management, and most other business processes. SAP ERP makes it possible to access the ERP database and applications through Internet access and web browsers. A sales representative can initiate the workflow for a sales order by filling out an electronic form on a notebook computer that is translated into input for the R/3 system. Other interfaces (such as Lotus® Notes®) can also be used. The web implementation adheres to the Workflow Client API standard of the Workflow Management Coalition (WfMC).

SAP ERP is delivered to a customer with selected standard processes turned on, and many other optional processes and features turned off. At the heart of SAP ERP are thousands of tables that control the way the processes are executed. This allows an organization to upgrade to any of the full range of SAP solutions, thus integrating with customer relationship management, product life cycle management, supply chain management, and supplier chain management.

SAP ERP offers four solutions that support the key functional areas of any organization:

SAP ERP Financials

This application provides a complete financial management solution for a broad range of industries. It integrates accounting, financial reporting, performance management, and corporate governance requirements of an organization.

SAP ERP Operations

This solution helps organizations achieve operational excellence in key areas of procurement and logistics execution, product development and manufacturing, sales, and services.

SAP ERP Human Capital Management

This solution delivers leading-edge human management capabilities to an organization that enables it to maximize workforce potential. It automates talent management, workforce process management, and workforce deployment, increasing the efficiency of the human resources available to them.

SAP ERP Corporate Services

This solution allows organizations to manage real estate, enterprise assets, project portfolios, corporate travel, environment, health, and global trade services more effectively.

#### SAP Product Life cycle Management (PLM)

SAP PLM is a software solution for collaborative engineering, product development, and management of projects, product structures, documents, and quality. SAP PLM software provides an information backbone to help access relevant information anywhere, anytime.

#### SAP Supply Chain Management (SCM)

SAP SCM enables adaptive supply chain networks by providing not only planning and execution capabilities to manage enterprise operations, but also visibility, collaboration, and radio frequency identification (RFID) technology to streamline and extend those operations beyond corporate boundaries.

#### SAP Supplier Relationship Management (SRM)

SAP SRM integrates strategic practices for supplier qualification, negotiation, and contract management. It does this tightly and cost-effectively with other enterprise functions and their suppliers' processes through a single analytical framework and support for multichannel supplier enablement.

#### Duet

Duet software enables seamless access to SAP business processes and data through Microsoft Office that interacts with enterprise applications. Duet is the result of a collaboration between SAP and Microsoft, and is the first joint product created and supported by these two companies.

#### Alloy

Alloy<sup>™</sup> by IBM and SAP, announced on January 19th, 2009, is a new product jointly developed and supported by both IBM and SAP.

Business users need easy, consistent access to people, processes, and information to improve productivity. With Alloy, business users can easily access SAP software and information from the IBM Lotus Notes environment, both online and offline. Because business users work in the familiar Lotus Notes environment, training is minimized, which helps speed adoption. The functionality provided by Alloy includes the following features:

- Reports management
- Leave management
- Travel management
- Workflow decision management

As a result, organizations can make business users more productive, improve decision making, and increase compliance with corporate policies, improve risk management and mitigation, with increased return on investment (ROI).

More information about Alloy by IBM and SAP is available from the following web page:

http://www.lotus.com/alloy

#### SAP xApps

The SAP xApps family of composite applications enables business innovation, provides the flexibility to respond quickly and profitably to business change, and maximizes the return on your strategic assets: employees, knowledge, products, business relationships, and IT.

#### SAP xApps Analytics

SAP xApp Analytics uses SAP NetWeaver Business Warehouse to unify and integrate disparate data from SAP, third-party, and custom corporate applications, existing systems, as well as externally syndicated information sources.

#### SAP xApps composite applications for governance, risk, and compliance

SAP xApps for governance, risk, and compliance (GRC) delivers information to control costs, manage risk, and meet compliance deadlines.

#### SAP xApps composite applications for mobile business

These ready-made applications provide your mobile workers (from salespeople to service technicians) with access to critical data and processes anytime, anywhere, and on a variety of mobile devices.

#### 1.3.3 SAP business solutions

SAP provides a comprehensive range of enterprise software applications and business solutions to empower every aspect of your business.

#### SAP BusinessObjects GRC Solutions

SAP BusinessObjects Governance, Risk, and Compliance (GRC) Solutions (SAP BusinessObjects GRC Solutions) enable a preventative, real-time approach to GRC across heterogeneous environments. The solutions provide complete insight into risk and compliance initiatives and enable greater efficiency and improved flexibility. They help customers to proactively balance risk and opportunity across their business processes in order to respond faster to changing business conditions.

SAP BusinessObjects GRC Solutions address the following processes:

Risk management

SAP BusinessObjects GRC Solutions help the user balance business opportunities with strategic, operational, financial, legal, and compliance risks to maximize opportunities and minimize risks.

Access control

SAP BusinessObjects GRC Solutions help the user manage access and eliminate fraud with confidence, and minimize cost of compliance.

Process control

SAP BusinessObjects GRC Solutions help the user ensure compliance and enable business process control management by monitoring controls and data across systems.

Global trade services

Reduced costs and lowered risk in international trade is a benefit of SAP BusinessObjects GRC Solutions comprehensive platform to provide the following task compliance:

- Trade compliance
- Cross-border transactions
- Trade agreements
- Environment, health, and safety management

SAP BusinessObjects GRC Solutions help the user address the following areas:

- Regulatory compliance
- Integrate the management of operational risks related to environment, health, and safety
- Address corporate sustainability initiatives
- Sustainability performance management

SAP BusinessObjects GRC Solutions helps the user track and communicate sustainability performance, set goals and objectives, manage risks, and monitor activities.

SAP BusinessObjects GRC Solutions enable risk management and regulatory and policy compliance across processes supported by both SAP and non-SAP software

#### Industry specific business solutions

SAP solutions for Governance, Risk and Compliance (GRC) enable compliance with regulations across industries, increasing business performance, and driving competitive advantage that support the following markets with requirements to predict and prevent financial and environmental risks:

- Automotive
- Banking
- Chemicals
- Consumer
- Products
- Technology
- Life Sciences
- Oil and Gas
- Utilities

#### Manufacturing

This is a solution for managing manufacturing operations that use Lean and Six Sigma<sup>1</sup>. This solution integrates manufacturing with other operations, and makes new changes on demand according to customer requirements.

#### Information workers

This solution is a portfolio of applications, helping people to use unstructured and structured processes, delivering personalized business context through familiar user environments, including Microsoft Office, mobile devices, and the Internet.

#### Service and asset management

This is a solution to manage service and maintenance from end to end. You can handle service sales and marketing, manage service-level agreements, oversee service call centers, track warranties and claims, and provide customer self-service over the Internet. You can also perform field service, in-house maintenance and repair, depot repair, and service parts management.

#### **Solution extensions**

This is cross-solution and cross-industry functionality that complements SAP solution capabilities.

#### 1.3.4 Small and midsize enterprise

SAP and its partners deliver prepackaged solutions and services (based on SAP Business All-In-One) incorporating industry-specific best practices and functions that can be implemented quickly and easily for midsize businesses.

#### **SAP Business One solution**

To help the new businesses stay profitable and remain competitive, SAP offers the SAP Business One solution. This solution helps emerging and dynamic businesses manage their operations efficiently and cost-effectively while overcoming the unique challenges they face. It is an affordable business tool developed specifically for small and mid-sized businesses.

- For companies or subsidiaries of 10 to several hundred employees, typically found in distribution, service, small manufacturing, and retail
- ► Simple to use and learn
- <sup>1</sup> http://en.wikipedia.org/wiki/Lean\_Six\_Sigma

- Powerful report generators
- Easy data navigation
- Implementation in a few days or weeks
- Offered for Windows and Linux
- Adaptable by implementation partners to customer or industry specific requirements industry adaptations available from partners
- Perfect solution for branches or subsidiaries of SAP accounts
- Data can be exchanged with SAP using SAP NetWeaver Exchange Infrastructure (XI)

#### SAP Business All-In-One partner solutions

SAP Business All-In-One solutions are designed for the small and mid-size enterprises. These solutions are pre-configured to meet the requirements of this industry segment.

- ► SAP Business All-In-One solutions are targeted for industries with 100–2500 employees.
- Designed for ease of use.
- ► Offers the power of SAP's world class business solutions.
- ► The solution is pre-configured and can be deployed in short time.
- ► It provides an easy to grow path and can be implemented in a phased approach.
- SAP Business All-In-One solutions are available on all platforms that run SAP NetWeaver, including Windows and Linux.
- ► SAP NetWeaver allows integration with non-SAP applications.

In collaboration with SAP, IBM offers small and mid-sized businesses a cost-effective way to get enterprise resource planning (ERP) applications up and running quickly. The SAP Business All-in-One fast-start program offers select System x and BladeCenter systems pre-tested and pre-configured with SAP Business All-in-One software.

#### **SAP Business By Design**

SAP Business By Design is a fully-integrated business management software solution. It is a good fit for fast-growing midsize companies or small businesses with 20 to 500 users, enabling them to have the benefits of large-scale business applications without the need for a large IT infrastructure. SAP Business By Design, based on the SAP NetWeaver platform, enables preconfigured process best practices for managing financials, customer relationships, human resources, projects, procurement, and the supply chain.

This offering is currently only available using SAP hosting services, under limited release. More information about this offering by SAP can be found at the following web page:

http://www.sap.com/sme/solutions/businessmanagement/businessbydesign

#### 1.3.5 SAP BusinessObjects

SAP BusinessObjects offers a broad portfolio of tools and applications designed to help customers optimize their business performance. With its acquisition of BusinessObjects in late 2007, SAP adds to its intelligence platform, a portfolio providing comprehensive solutions to optimize business performance. The following solutions can help defining business strategy, closing the gap between strategy and execution, and balancing risk and profitability:

- SAP BusinessObjects business intelligence solutions
- SAP BusinessObjects information management solutions
- ► SAP BusinessObjects enterprise performance management solutions
- ► SAP BusinessObjects governance, risk, and compliance solutions

More information about the SAP BusinessObjects portfolio can be found at the following web page:

http://www.sap.com/solutions/sapbusinessobjects

#### 1.3.6 Integrated SAP solutions

With their integrated solutions, also referred to as *SAP Appliances*, SAP has implemented a new distribution strategy. The software now comes pre-installed, only a minimal configuration is required to integrate it into the customer's environment. The solution is based on predefined Hardware, enabling a quick setup for test- or demo-systems, or proof-of-concepts. By having only a few hardware configurations to support, SAP and the hardware partners are able to test those configurations.

In contrast to most other SAP products there is only a limited set of hardware and software so it is much easier to ensure not only the quality of the components but also the solution as a whole. SAP and the hardware partners (for example Intel® and IBM) ensure the desired performance and stability.

All of that is reducing the cost of operation, through minimized maintenance, easy scalability through blade server architecture where appropriate, affordable hardware, optimized hardware and software support offers, and a minimized upgrade risk.

Integrated SAP solutions that are available from IBM are as follows:

- SAP Business Warehouse Accelerator
- SAP Discovery System
- SAP Enterprise Search

More information about these solutions is available at the following web page:

http://www.ibm-sap.com/systems

#### 1.3.7 Platforms

SAP provides a comprehensive range of enterprise software applications and business solutions to empower every aspect of your business operations.

#### SAP Enterprise Service-Oriented Architecture (SOA)

SAP Enterprise SOA is a blueprint for an adaptable, flexible, and open IT architecture for developing services-based, enterprise-scale business solutions. With SAP NetWeaver as a technical foundation, enterprise SOA moves IT architectures to higher levels of adaptability and moves companies closer to the vision of real-time enterprises by elevating web services to an enterprise level.

#### SAP NetWeaver

This platform incorporates business functionality, exposed as ready-to-use enterprise services and process components, through its enterprise services repository. It also provides an integrated platform of composition technologies for business processes, composing applications, and deploying solutions.

SAP NetWeaver is an open technology platform that unifies technology components in a single platform, reducing the need for custom integration and ensuring that mission-critical business processes are reliable, secure, and scalable.

SAP introduced NetWeaver to enable organizations to integrate their SAP and non-SAP solutions. Because NetWeaver supports both present and future SAP and non-SAP solutions, the platform is the center of a growing ecosystem of applications and services. The objective of describing this tool in this paper is to highlight its importance in building up the SAP environment.

SAP is evolving its solutions into service-oriented business applications based on NetWeaver, allowing SAP applications to integrate with non-SAP applications. For the first time, SAP is offering its platform for third-party development. Many independent software vendors are already building their applications on SAP NetWeaver.

Initially launched as an integration and application platform, SAP NetWeaver has evolved to become a composition platform, allowing model-based development to enhance open enterprise services that are delivered by SAP Business Suite applications. In 2006, SAP NetWeaver was enhanced to extend its use as a business process platform.

SAP NetWeaver reduces TCO across an organization's IT landscape, freeing up the resources and enabling a customer to refocus on growth. Its components are integrated in a single platform and come pre configured with applications, eliminating the need for many integration projects, reducing complexity, and speeding up implementation. The platform supports IT standardization and consolidation, so that companies can use all their existing IT investments, including both SAP and non-SAP systems.

NetWeaver is a web-based, cross-application platform that can be used to develop not only SAP applications but others as well. NetWeaver allows a developer to integrate information and processes from geographically dispersed locations using diverse technologies, including Microsoft .NET, IBM WebSphere® and Sun Java technologies.

NetWeaver has been tagged as a product that can help spur industry adoption of web services. Although web services are often seen as the development model of the future, the implementation rate has not been high, often because of competition and incompatibility among enabling products.

How can NetWeaver be used to extend existing SAP solutions with custom components? There are several ways:

- If you are starting from scratch, the Composite Application Framework can support the development of components that are specifically designed to run in the NetWeaver environment.
- If the custom components have already been deployed in a .NET, J2EE, or WebSphere environment, NetWeaver is designed to support their migration to run in the Web Applications Server.

#### Components

The components of NetWeaver are as follows:

SAP NetWeaver Application Server

This component supports platform-independent web services, business applications, and standards-based development that enable you to use existing technology assets for web services-oriented solutions.

SAP NetWeaver Business Intelligence

This component enables you to integrate data from across the enterprise and transform it into practical, timely business information to drive sound decision-making.

SAP NetWeaver Exchange Infrastructure

This component delivers open integration technologies that support process-centric collaboration across the extended value chain.

SAP NetWeaver Master Data Management

This component ensures cross-system data consistency and helps integrate business processes across the extended value chain.

SAP NetWeaver Mobile

This component provides a future-proof mobile runtime environment based on open and flexible technology standards and a powerful development environment for building integrated mobile solutions with native or browser-based user interfaces.

SAP NetWeaver Portal

This component unifies critical information and applications to give users role-based views that span the enterprise, enabling you to take full advantage of your information resources.

SAP Auto-ID Infrastructure

This component gives you all the capabilities you need to integrate all automated sensing devices - including RFID readers and printers, Blue tooth devices, embedded systems, and bar-code devices.

#### Tools

The NetWeaver tools are as follows:

Adaptive Computing Controller

This tool provides a central point of control for assigning computing resources and optimizing their use.

SAP Composite Application Framework

This tool provides a robust environment for the design and use of composite applications that comply with enterprise SOA.

SAP NetWeaver Developer Studio

This tool offers a convenient user interface and rich functionality for developing J2EE applications.

SAP NetWeaver Visual Composer

This tool simplifies the creation of portal content and analytic applications, enabling business analysts to build or customize applications using a visual user interface rather than manual coding.

SAP Solution Manager

This tool facilitates technical support for distributed systems with functionality that covers all key aspects of solution deployment, operation, and continuous improvement.

#### Ecosystem

Members of SAP's highly interactive ecosystem of customers and partners collaborate through a variety of communities and programs, including SAP Developer Network (SDN), Enterprise Services Community, industry value networks (IVNs), and partner solutions.

#### 1.4 SAP and IBM System x: A key relationship

SAP and IBM have worked closely on many levels, from joint product development and customer support to providing turnkey solutions to customers. The IBM X-Architecture® family of products is designed to meet the growing computing demands of the SAP system landscape with unequalled price and performance. The simplification of deployment and maintenance allows SAP customers to focus on their implementation and better manage their infrastructure costs. These are critical considerations when deploying any complex software solution, especially SAP.

The X-Architecture family is a powerful, easy-to-use, and cost-effective industry standard IT system for SAP solutions. It is an ideal platform for SAP customers that are looking for reliability, manageability, and scalability with the flexibility to run Windows or Linux. The X-Architecture family is the foundation of a cost-effective SAP solution landscape. This family of products provides a low cost, scalable platform with superior performance and unmatched reliability.

This offering delivers important value to IBM and SAP customers:

- The IBM X-Architecture family provides unmatched reliability, manageability, and scalability in cost-effective systems.
- ► Choice of Linux, Windows, or Solaris operating systems.
- Enterprise-class robustness with hot-swap components and robust mainframe inspired technologies of the IBM eX5 platform. These systems were designed with high-availability enterprise workloads (such as SAP) in mind.
- IBM eX5 systems meet the SAP landscape needs with pay-as-you-grow capabilities, delivering exceptional, flexible, cost-effective scalability for future growth.
- FlexNode automatic node failover ensures better 8-socket availability than monolithic 8-socket designs.
- Server consolidation on to x3850 X5 and x3690 X5 with MAX5 resulting in fewer physical SAP systems to manage, thereby lowering costs.
- MAX5 memory expansion and integrated SSD technology to increase your system's memory and storage, deliver larger, faster databases, and reduce the need for additional SAP systems or external storage.

The IBM X-Architecture family of products, based on 64-bit Intel Xeon® or AMD Opteron processors, attract the following customers:

- Any customer evaluating SAP solutions.
- Existing customers who have reached the limit of their current server capacity and need more power for their SAP application.
- Customers who are running back level SAP releases and need to upgrade to avoid the end-of-maintenance trap.
- Those who are looking for new levels of reliability, manageability, and scalability in a cost-effective 64-bit platform.
- Any existing SAP customer considering the addition of SAP components.
- Existing SAP customers that are considering consolidation and simplification of their application server layer.
- Customers who want to use virtualization technology to increase the use of their infrastructure, to save on administration cost.

For more information about SAP applications that run on IBM System x and BladeCenter systems, see the following web page:

http://www.ibm.com/systems/x/solutions/infrastructure/erpcrm/sap.html

## 2

## Sizing

Sizing is the process by which the performance requirements of the system (for example, response time and throughput) determine the right hardware configuration. In this context, *right* means able to deliver the expected performance at a minimum cost.

This chapter has the following topics:

- ► 2.1, "Sizing methodology" on page 20
- ► 2.2, "Sizing the IBM solution" on page 22
- ► 2.3, "Summary" on page 24

#### 2.1 Sizing methodology

The IBM and SAP sizing methodology is based on SAP benchmarks, information from SAP, and actual customer experiences. IBM uses sizing tools and customer input to approximate the system resource requirements; however, actual customer results can vary. Prior to ordering the final hardware configuration, all customers should consult with a trained SAP Basis specialist to develop a detailed plan for the SAP product implementation. If you have any questions after reviewing this information, contact IBM.

This section explains the IBM and SAP sizing methodology, terminology, and basic information that helps you to understand the sizing process and sizing estimate results.

#### 2.1.1 The SAP Quick Sizer

SAP provides all partners and customers with a web-based sizing tool called the Quick Sizer. Customers can provide input directly through this tool or provide IBM with sufficient information to enable a sizing to be undertaken on their behalf.

The SAP Quick Sizer guides the user through a structured sizing questionnaire. The Quick Sizer gathers information about an organization's business requirements and translates this data into generic system requirements; that is, platform independent specifications for processor, memory, and disk. The Quick Sizer offers two sizing models:

User-based sizings

The user-based model asks the user to count the number of active users by the SAP functional module. SAP considers this model to be limited in its ability to estimate the SAP resource requirements because it does not consider important sizing factors (such as user behavior, peak versus average workload, the amount of batch processing, reporting, and user customization). SAP recommends the user-based sizing model for small businesses only.

Quantity-structure-based sizings

The quantity-structure-based model is more thorough than the user-based model because it considers actual or expected SAP workload throughput. Besides the number of SAP users, this model gathers detailed information about the business processes and objects used, including the number of dialog transactions, workload profiles, peak usage times, retention periods for business objects, and background and reporting processes. SAP recommends the quantity-structure-based model for medium and large businesses.

Customers can complete the user-based sizing questions, quantity-structure-based sizing questions, or both. When both models are used, the Quick Sizer provides SAP workload estimates for both models; however, the IBM sizing specialist will develop the IBM hardware recommendation from the two workload-estimates, in concurrence with the customer.

#### 2.1.2 IBM sizing and planning questionnaire for SAP solutions

The sizing questionnaire is used to gather the requirements that are used to estimate the hardware resources to run SAP Business Suite on IBM servers. The questionnaire was designed so that it can be answered without detailed knowledge of SAP solutions. IBM has established the Techline Solutions Sizing team to provide assistance to queries and to help size and configure a target SAP solution. These have been established on a geographical basis to address them locally. The IBM Sizing and Planning Questionnaire for SAP Solutions can be obtained from the following web page:

http://www.ibm.com/erp/sizing

The purpose of this questionnaire is to collect information to estimate the IBM hardware resources required to run the SAP application suite on IBM Systems platforms including System z®, Power Systems<sup>™</sup>, System x or mixed environments. The sizing estimate results include recommendations for CPU, memory, and disk for the server infrastructure. In addition, information from the sizing questionnaire can be used by an IBM sales representative or Business Partner to develop an IBM infrastructure proposal including additional hardware and software (for example, for systems management to support the SAP applications).

A sizing estimate is an approximation of the hardware resources required to support an SAP solution or component implementation. It is a pre-sales effort based on information available at a point in time, providing an entry into understanding the customer's hardware requirements. Customers' actual experiences will vary from the sizing estimate for many reasons, including batch and reporting workloads and custom code. The degree of variability can range from small to significant.

Sizing the hardware requirements for each customer's SAP implementation is an iterative process, which can be refined and repeated a number of times. Check the sizing input data and estimations during the implementation project. It is important to understand that the sizing estimate is a pre-installation effort mainly based on standard assumptions and benchmark performance data. It cannot replace capacity planning for installed systems.

#### 2.1.3 SAP Application Benchmark Performance Standard (SAPS)

The basic SAP workload unit is SAPS. SAPS is a definition of throughput coined by SAP capacity planning and performance testing personnel.

100 SAPS are defined as 2,000 fully business processed order line items per hour in the standard SAP SD application benchmark. This is equivalent to 2400 SAP transactions per hour with SAP R/3.

The capability of processors is measured during the standard SD benchmark test, certified by SAP, which rates the processor on its capability to process work at 100% CPU loading.

The SAP Quick Sizer calculates the workload (in SAPS) and adjusts it to allow for a suitable processor use. So, if a workload of 4,800 SAP SD benchmark transactions per hour was required, the Quick Sizer calculates this as 200 SAPS, but, allowing for a target processor load of 33%, adjust this to find a processor capable of 600 SAPS @ 100% (=200 at 33%).

In an SAP environment, there are three workloads that a processor might perform:

- Database Server Function
- Application Server Function
- Central (2-tier) Function

IBM rates each of its processors on its ability to perform each of these functions. These calculations are based on SAP-certified benchmarks. IBM uses its judgement to calculate combinations not benchmarked. SAP-certified benchmarks are performed for database servers and central servers only, so application server numbers are calculated on the results of considerable field experience expressed as the number of application servers per database server.

The vast majority of customers run database servers with central instance functions (for example, messaging, lock management, and spooling) running on the database server. As a result, the SAP benchmarks are run with these functions off-loaded.

SAPS ratings relate to an absolute business-related workload. So the changing complexity of SAP applications causes the ratings to vary from one release of SAP to the next.

#### Changes to the SAP SD Benchmark

Since January 1st, 2009, the SAP SD Benchmark was changed to reflect the standards of today's installations. The following elements have changed:

- All benchmarks now must use a Unicode codepage
- The response time for the SD benchmark must now be less than one second (it was required to be less than two seconds previously)
- Use of the New General Ledger
- Activation of Credit Limit Check functionality
- Use of SAP Business Suite 7 (SAP ERP 6.0 Enhancement Package 4)

The definition of SAPS as described stays the same. However, an SAP SD benchmark results measured on a machine will have a lower SAPS value with the new benchmark than with the old one, due to higher resource consumption.

Measurements showed that the new benchmark uses about 7% more resources, when comparing Unicode benchmarks. Earlier measurements showed that Unicode consumes about 20% more resources than ASCII.

Compared to an old ASCII codepage benchmark on the same machine a new Unicode codepage benchmark show a result approximately 28% lower.

#### 2.2 Sizing the IBM solution

IBM uses information from both the SAP Quick Sizer and the questionnaire as input to the hardware mapping process. The Quick Sizer provides processor, memory, and disk requirements. This section explains how we use information from the Quick Sizer tool to develop the IBM hardware recommendation.

#### 2.2.1 Target CPU utilization

Based on the sizing inputs, the Quick Sizer approximates processor, memory, and disk consumption. For user-based sizings, SAP's sizing results are calculated to meet an average CPU use of 65% for the online interactive workload, including a buffer for unspecified workloads (such as batch jobs, reporting, printing, backup, software interfaces, and so on) and for peak periods. The Quick Sizer quantity-structure-based model also uses a target CPU use of 65%. Different target CPU utilizations can be calculated with the mutual concurrence and responsibility of both the IBM sales team and the customer.

#### 2.2.2 Resource categories

For the processor and the disk, the Quick Sizer results are expressed as resource categories, which are SAP's hardware independent resource specifications.

For CPU sizing, each resource category represents a range of SAPS and disk space. Table 2-1 shows an example of the CPU and disk resource categories and the SAPS and disk space requirements.

Category	up to SAPS	up to GB disk	up to I/Os per sec.
XS	2,000	100	800
S	8,000	250	3,000
Μ	16,000	500	6,000
L	24,000	1,000	10,000
XL	36,000	1,300	14,000
XXL	Contact IBM or SAP for	detailed sizing	

Table 2-1 CPU and disk sizing resource categories

If your CPU sizing exceeds 36,000 SAPS or your disk sizing exceeds 1.3 TB or the I/O value is more than 14,000 I/Os per second, contact IBM or SAP for a detailed sizing.

Figure 2-1 shows SAP Quick Sizer referring to these resource categories.

All SAPS Memory and disk							
Active Users	Results	for SAP Bug	siness Solu	tions			
Solution	Releas	e CPU cat.	APS (total)	Memory (total, MB)	DB Disk cat.	DB Disk (MB, total)	
NW-APPSRV	640	М	7.800	46.080	L	420.000	

Figure 2-1 Resource categories in SAP Quick Sizer

For a memory recommendation we use IBM hardware and SAP software configuration dependent factors specified in the internal IBM SAP Sizing Guidelines on the following IBM intranet web page (accessible to IBM personnel only):

http://w3-03.ibm.com/sales/support/ShowDoc.wss?docid=KTOS-5PHLFD&infotype=SK&infos ubtype=W0&node=clientset,IA

#### 2.2.3 Steps in the sizing process

IBM performs the following steps for every Quick Sizer sizing request:

1. Determine the customer's potential SAP workload requirements.

The SAP Quick Sizer analyzes customer input and calculates a generic sizing result. The Quick Sizer provides the memory requirement and resource categories for CPU and disk.

**Note:** If the customer completed both the user and quantity-structure-based sizings with reasonable inputs, we strongly recommend discussing the two workloads with the customer to determine the IBM hardware requirements. This can vary subject to the analysis of the two results.

2. Select either a 2-tier or 3-tier hardware configuration.

Based on the potential customer workload, we select either a 2-tier or 3-tier hardware configuration. In a 2-tier configuration, one server provides both the database and application server functions. In a 3-tier configuration, there is one database server and one or more separate application servers. If one server can handle both the database and application server workloads, we select the 2-tier configuration. This is typically appropriate for customers with smaller SAP workloads. If the customer workload does not fit in a single server, we select a 3-tier configuration. Take special system landscape considerations into account.

3. Determine the IBM server requirements.

Based on the SAPS capacity rating for each IBM processor, we find database or central servers that can support at least the number of SAPS indicated by the Quick Sizer. For application servers, the work can be split across a numbers of servers whose joint capability must exceed the target SAPS number.

#### 2.3 Summary

The IBM and SAP sizing methodology is continually reviewed and revised to provide the best possible estimate of the IBM hardware resources required to run SAP. Guidelines for sizing SAP solutions come from a number of sources, including SAP, SAP benchmarks, and customer feedback. Based on this information and your completed sizing questionnaire, IBM analyzes your requirements and recommends an IBM hardware configuration.
# Hardware and software considerations

This chapter describes major factors of software and hardware for future SAP based solution installations. These topics are covered:

- ► 3.1, "SAP Business Suite hardware implementation strategy" on page 26
- ► 3.2, "Virtualization" on page 26
- ► 3.3, "Solution architecture considerations" on page 30
- ► 3.4, "Choosing the right hardware" on page 34
- ► 3.5, "Hardware solution samples" on page 39

# 3.1 SAP Business Suite hardware implementation strategy

During production operation, most customers maintain separate non-production and production systems running on separate IBM servers. This strategy has several advantages:

- New releases and system modifications can be tested without affecting the users.
- Customers can minimize their initial hardware investment by installing the hardware in phases.

During the application development phase, customers typically install one or more non-production systems for development and testing of the SAP system. In many cases, each non-production system is a 2-tier configuration running on its own server. In addition to the development and quality assurance systems, customers install additional servers for other non-production systems (for example, training system, sandbox system, and so forth).

When the SAP system is ready to run in production, customers install the production system hardware. For 3-tier configurations, as new users are added to the production system, additional application servers can be installed and the database server upgraded, as needed. For 2-tier configurations, as users are added to the system, the central database/application server can be upgraded to handle the additional workload. Also, if a 2-tier installation grows beyond the capability of a single-server, it can be configured as a 3-tier configuration with the addition of application servers.

# 3.2 Virtualization

This section covers the reasons for virtualization of SAP systems on the x86 platform and the options available.

# 3.2.1 Why virtualization?

There are a number of motivations for using virtualization. The primary focus for all of the motivations is reduction of complexity and the total cost of ownership of the IT landscape.

# Landscape consolidation

Today's SAP landscapes are growing more and more complex. Starting with the classical development, test, and production system landscape, extending these with sandbox or educational systems, deploying these systems into a 3-tier configuration with multiple servers per system, and adding infrastructure-related systems (such as the SAP Solution Manager), a customer's SAP system landscape can easily grow to several dozens of physical SAP system servers.

SAP systems are normally sized for the capacity that is required to handle the critical peak workload, which often represents only a small part of the system's day, month, or even year. By consolidating a number of dedicated servers, each running at an average low use with periodic peaks, into a shared virtualized environment, a reduction of physical servers can be achieved, leading to less cost and reduced complexity.

#### Load shifting

The ability to move virtualized SAP systems seamlessly between physical servers enables you to move applications that temporarily demand more resources than the physical server they are currently running on, to a more powerful server easily when needed. This way an application that needs increased resources only once a year, once a quarter, or once a week

(for example, for a high-load batch run) can be moved to a powerful server for that task, while residing on a less powerful server for the other times. In general, virtualization gives you much more flexibility in your SAP system planning, enabling you to use the existing physical resources much more effectively.

#### **Optimized application availability**

Another useful scenario is to free physical servers for scheduled maintenance. Before taking down the server for the maintenance, all virtualized SAP systems are moved to other available physical servers in the datacenter. This way the server can be shut down without affecting the application's availability, thus maximizing the application uptime while being able to service your servers independently from application availability requirements. In the event that a physical server fails, a virtualized SAP system, represented as files on a shared storage system, can be brought up again on a new server quickly, without having to wait for hardware service.

#### Rapid provisioning

Virtual machines can be duplicated easily, as they are basically represented by a set of files. With virtualization it takes only minutes for a new virtual server to be up and running. This is a big advantage, compared to the time it takes to put a physical server in place. The physical server needs to be mechanically mounted, connected to cables, the operating systems needs to be installed, patches need to be applied, parameters need to be modified, and the desired application must be installed.

Rapid provisioning helps in quick setup of additional SAP application servers to increase the performance of an SAP system by scaling out, and enables providing sandbox SAP systems for testing or education, on demand within minutes instead of days. You can use resources that might otherwise remain unused, sitting idle waiting for higher workload times.

These possibilities, provided by virtualization, help to increase server use and application availability and provides a high degree of flexibility.

# 3.2.2 Virtualization technologies

There are a number of virtualization technologies available for SAP on IBM System x and BladeCenter today. This section gives you an overview on what is available and what is supported by SAP, for productive SAP systems.

**Note:** This section covers virtualization technologies available for SAP on IBM System x or BladeCenter servers based on Intel or AMD processors only. For SAP virtualization on IBM Power Systems, see IBM Redbooks publication *SAP Applications on IBM PowerVM*, SG24-7564.

#### Supported guests overview

There are restrictions with virtualization, with regard to the support of virtualized, productive SAP systems. Table 3-1 shows the support status, depending on the virtualization technology used, and the operating system used for the virtualized SAP system.

Virtualization technology	Windows guest systems	SLES guest systems	RHEL guest systems	Solaris x86 guest systems
VMware ESX	Yes	Yes	Yes	No
Hyper-V	Yes	Yes	No	No
XEN	No	Yes	Yes	No
KVM	No	No	Yes	No
Solaris Zones	No	No	No	Yes

Table 3-1 Virtualization support status overview

For all of these combinations, supported or not, restrictions apply. The following sections list the most important and tell you where to find more information about support and restrictions.

#### VMware

VMware ESX was the first virtualization technology to be supported by SAP for productive SAP systems. On December 12th, 2007, VMware and SAP announced<sup>1</sup> support for productive SAP systems on virtualized 64-bit Microsoft Windows Server 2003 systems.

SAP supports VMware in production and non-production environments. The Windows version used must be Windows Server 2003 (or higher) and the SAP system must use a Kernel Version of 6.40 or higher. More details on the support status and restrictions that apply can be found in SAP Note 1409608. SAP Note 1104578 describes how to use enhanced virtualization monitoring with Windows.

For servers that have ServerProven<sup>®</sup> status for VMware ESX<sup>2</sup> and are certified for SAP on Windows or for SAP on Linux, it is supported to run SAP software in a virtualized Windows or Linux environment.

Linux systems virtualized with VMware ESX are supported on server systems that are listed on the following web page (see also SAP Note 895807):

http://www.sap.com/linux

#### Xen

Since December 2007, SAP supports running SAP on Linux inside a XEN virtual machine. The Linux distributions that can be used for Xen virtualization are Red Hat Enterprise Linux 5 QU1 (RHEL5.1) and Novell SUSE Linux Enterprise Server 10 SP1 (SLES10 SP1). Later releases of both SLES and RHEL are supported as well. The host system and the guest system must run the same Linux distribution, unless another host/guest combination is supported by the Linux distributor (for example, Novell or Red Hat). With XEN, only para-virtualization is supported, meaning that the guest systems have to know it is virtualized by XEN virtualization. Full virtualization is not supported with XEN.

More details on the support status and restrictions that apply can be found in SAP Note 962334.

<sup>&</sup>lt;sup>1</sup> See http://www.vmware.com/company/news/releases/sap\_fullsupport.html for the press release

<sup>&</sup>lt;sup>2</sup> For IBM System x servers see http://www.ibm.com/servers/eserver/serverproven/compat/us/nos/vmware.html

# Hyper-V

Hyper-V comes with Microsoft Windows Server 2008. The following guest systems can be used (desktop versions of these operating systems are not relevant for SAP):

- Windows Server 2008 x86 & x64 (VM configured as 1, 2 or 4-way SMP),
- Windows Server 2003 x86 (VMs configured as 1 or 2-way SMP only),
- Windows Server 2003 x64 (VMs configured as 1-way only)
- ► SUSE Linux Enterprise Server 10 with Service Pack 1 x86 & x64 Edition

More details on the support status and restrictions that apply can be found in SAP Note 1409608. Furthermore, additional information and FAQs about virtualization of SAP applications on Windows is available on the following web page:

http://www.sdn.sap.com/irj/sdn/windows-virtualization

#### KVM

The newest virtualization technology approved for productive use with SAP is KVM. It comes as part of the Red Hat Enterprise Linux Server (RHEL) and has been tested on Red Hat Enterprise Linux 5.4 (RHEL 5.4). Later Releases of RHEL 5 are supported as well. KVM only supports full virtualization. Para-virtualization is not possible with KVM. Only Red Hat Enterprise Linux 5.4 for x86\_64 is supported as a guest operating system for running SAP servers.

You can only run your host system on hardware which is certified for Linux KVM environments. Details can be found in SAP Note 171380 or by following the "Supported Platforms" link on the following web page:

http://www.sap.com/linux

More details on the support status and restrictions that apply can be found in SAP Note 1400911.

#### Solaris Zones

Solaris Zones are a virtualization technology that can help to overcome the deficiencies encountered when installing multiple SAP instances/systems on one server. Solaris Zones are only supported with Solaris. More details on the support status and restrictions that apply can be found in SAP Note 1246022.

**Tip:** Although SAP solutions can be fully supported running inside a virtualized environment, database vendors can have different support statements when running in a such an environment.

# 3.2.3 IBM for virtualized SAP systems

IBM System x enterprise servers are the ideal platform for business-critical and complex SAP applications (such as database processing, customer relationship management and enterprise resource planning) and highly consolidated, virtual server environments. With multiple workloads running on the same server, performance remains important but reliability and availability become more critical than ever. Servers with IBM eX5 technology are a major component in a dynamic infrastructure. They offer significant new capabilities and features that address key requirements for customers with SAP landscapes.

Dynamic Infrastructure® is designed to address today's challenges and tomorrow's opportunities. It provides the following benefits:

- Help solve customer challenges:
  - Space constrained data centers
  - Maxed-out data center power
  - Rising management costs
  - Under-used servers with expensive software licenses
- Reduce costs
  - Greater business productivity by making use of server performance
  - Consolidation of up to 32 racks of equivalent 1U machines onto one virtualized eX5 system
  - Equal performance at less cost for high performance configurations
- Manage risks
  - High levels of reliability with more predictive failure analysis, node failover, and Memory ProteXion for greater uptime
  - Investment protection with 2- and 4-socket servers that can scale as your business grows
- Improved service
  - Easier administration with consolidated single points of management
  - Greater productivity out of fewer systems and software licenses

# 3.3 Solution architecture considerations

The implementation of SAP systems is a complex and expensive effort with a major impact on company life. Because the introduction of an ERP system entails the re-engineering of internal business processes, the introduction of SAP does not only concern the IT department. Indeed, entire departments, and sometimes the entire company, are usually asked to take part in the definition of new optimized SAP controlled business processes. Besides dedicating employees to the support of SAP customizing and ABAP (Advanced Business Application Programming) or Java development, the company should also invest in IT resources to guarantee the achievement of system operational requirements, particularly performance, availability, and serviceability.

With the focus on functional requirements for a solution, in most cases and also with regard to non-functional requirements such as performance, reliability requirements, or the ability of an SAP installation to handle increasing loads, there are a few things to consider when designing the SAP solution. The next sections give a short overview of your options.

# 3.3.1 Scaling up or scaling out

Scalability is key to the successful implementation of an ERP software. Your business will grow, and you also expect this ability to grow from your SAP system. The SAP software is designed for scalability, with the ability to perform the following tasks:

- Scale up (also known as vertical scaling) with a 2-tier system
- Scale out (also known as horizontal scaling) with a 3-tier system

#### 2-tier system

This type of topology presents a configuration where all components reside on the same machine. It is easy to install and maintain and is therefore appropriate for first-time installations when you want to test and familiarize yourself with the functions of the application server. At this stage, it is easy to determine what kind of topology is needed and to plan the system landscape. Although this topology is easily configurable and inexpensive, it has drawbacks that you must consider. Because all components are located on a single machine, they compete for resources, which affects the performance processes.

This configuration can be enhanced with horizontal scaling.

Some of the key advantages of a 2-tier system configuration are as follows:

- Uses the power of 64-bit and scalability.
- Best performance (no overhead for connection to DB, no network traffic, no shadow processes)
- Easiest to administrate

The 2-tier approach is suited for small installations or installations with performance demands not being dynamic. Large installation (for example, using the System x3950) can use the additional performance you can get from this type of installation.

#### 3-tier system

In contrast to the 2-tier system, in this topology the application servers run separated from the database server on different machines. By separating the servers onto separate machines, the capacity of a single machine in terms of performance can be lower than in a 2-tier environment.

Some of the key advantages of a 3-tier system configuration are as follows:

- Lower TCA (total cost of acquisition) with big configurations
- Scales flexibly (scale out)
- Affordable and flexible high availability concepts
- Application dependent, some SAP applications require a 3-tier configuration, for example, APO
- ► Cover short time load peaks easily by adding application servers temporarily

In general, the 3-tier approach is the more flexible, and often the only viable one, especially for large installations.

# 3.3.2 High availability

As more and more customers deploy SAP systems in SAP Business Suites for their global operations to support mission-critical business functions (such as sales and order-entry and continuous manufacturing) the need for maximized system availability becomes crucial. Many companies now require 24x7 reliability for their SAP systems.

Clustering is the use of multiple computers connected to act as a single entity to run common tasks. If one computer fails, the others pick up the workload automatically. By adding more computers, you can increase the power and, hence, the design can support more users.

Switchover clusters guarantee high availability of the SAP system by switching critical services, representing a single point of failure (SPOF), across multiple hosts in the cluster. When a primary node fails or is taken down for maintenance, switchover software automatically switches the failed software unit to another hardware node in the cluster. Applications or users accessing the failed service experience a short delay but resume normal processing after the switchover. Figure 3-1 shows an example of a switchover setup for SAP.



Figure 3-1 Example of a switchover setup for SAP (© SAP AG 2007, 2010. All rights reserved.)

You can find more information about high availability with SAP in the paper *Technical Infrastructure Guide - SAP NetWeaver 7.0*, available from the following web page:

https://service.sap.com/installNW70

There also is a central SAP note for NetWeaver High Availability capabilities (SAP note 803018).

There are a number of high availability solutions available to complement any IBM System x or BladeCenter configuration. Some of these are defined in the sections that follow.

#### High Availability (HA) with Tivoli System Automation software

IBM Tivoli® System Automation (TSA) for Multiplatforms is a high-availability cluster solution that provides several monitoring mechanisms to detect system failures and a set of rules to initiate the correct action without any user intervention. The set of rules is called a policy, which describes the relationships between applications or resources. TSA for Multiplatforms features predetermined policies for the complete SAP stack: DB2, DB2 HADR, Oracle, SAP Enqueue, including Application Server, SAP Router, NFS, and so forth. It manages availability of business applications, running in single AIX® or Linux systems or clusters.

IBM provides a no-charge two-node license of Tivoli SA MP for the IBM DB2 database server, so that the only licenses to set up the SAP central instance for HA are required.

More information about TSA for Multiplatforms is available from the following web page:

http://www.ibm.com/software/tivoli/products/sys-auto-multi/

Tivoli Storage Manager (TSM), helps you manage and automate your backup and recovery procedures and is designed to work in a clustered environment. The IBM Redbooks publication *IBM Tivoli Storage Manager in a Clustered Environment*, SG24-6679, is an easy-to-follow guide that describes how to implement IBM Tivoli Storage Manager products in highly available clustered environments. It is available from the following web page:

http://www.redbooks.ibm.com/abstracts/sg246679.html

#### High Availability with Veritas software

Veritas Storage Foundation HA for Windows brings advanced volume management technology to Windows Server 2003 and Windows 2000 environments. The combination of Storage Foundation HA for Windows and Veritas Cluster Server lets you automate cluster monitoring, and in the case of a detected failure, enables a graceful fail-over to an available server.

A white paper on how to implement a highly available environment using Symantec's Veritas Storage Foundation HA with Veritas Cluster Server software, published by the IBM SAP International Competence Center (ISICC), is available through IBM TechDocs at the following web page:

http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100970

#### High Availability with Microsoft Cluster Server

Microsoft Cluster Server (MSCS) provides the capability for a server's resources to fail over from one machine to another. MSCS is part of the operating system in Windows Server 2003, Enterprise Edition and Datacenter Edition. This service provides HA and scalability for mission-critical applications (such as databases, messaging systems, file and print services) and can be used to implement a highly available SAP system.

The white paper *MSCS Configuration and Support Information for SAP NetWeaver '04 and 7.0*, available at the SAP Community Network, provides you with general information about MSCS, and typical SAP MSCS configurations and support information. It is available on the following web page:

https://www.sdn.sap.com/irj/sdn/windows

#### 3.3.3 When to use virtualization

In 3.2.1, "Why virtualization?" on page 26 we discussed the pain points that can be resolved with virtualization. Although it might always be a desirable path to take, it is not always the right decision to virtualize everything. Virtualization comes with a price in terms of performance and limitations.

When virtualizing we have to take three kinds of virtualization into account:

CPU virtualization

CPU virtualization provides virtual CPUs to the virtualized guest systems. Each virtualized guest appears to run on a dedicated CPU, or set of CPUs, with each CPU having its own registers and control structures. Virtualization solutions usually limit the number of these virtual CPUs per virtualized guest system.

Memory virtualization

Every access to memory in a virtualized environment needs to be managed by the virtualization layer (the hypervisor), translating virtual memory addresses into physical ones. Memory virtualization is supported by the CPUs with features (such as page-table virtualization) that allow the hypervisor to handle memory access by the guest systems efficiently. As with CPUs, the virtual memory available to virtualized guests might be limited, depending on the virtualization solution used.

I/O virtualization

In a virtualized environment I/O subsystems (such as network, local disk or Fibre Channel access) must be virtualized as well. I/O virtualization was a problem in the early days of x86-virtualization and to an extent still is. Workloads that generate high volumes of I/O tend to see a performance degradation when being virtualized. An example of such a workload is a database server. So, while it might be a viable path to go for smaller database installations, consider running really high-load database servers on physical hardware (that is, not virtualized), and only virtualize the application server parts of an SAP system.

IBM and several other SAP hardware partners conducted SAP SD benchmarks with virtualization enabled, to show the performance difference between a virtualized and a non-virtualized system. These benchmarks run a single guest on the physical server, by which the performance penalty for the introduction of the virtualization layer into the stack is shown. Benchmarks indicate that virtualization, depending on technology used, introduces a performance degradation of less than 10%. Given the low accuracy that can be achieved with a usual sizing, this number is small enough not to affect how you size your SAP solution.

In addition to the performance penalties, there are limitations for virtualized guest systems. Each of the virtualization technologies have limits regarding the maximum number of virtual CPUs, the maximum amount of memory, and, possibly, other parameters of the virtualized system.

# 3.4 Choosing the right hardware

Choosing the right hardware for a complex solution such as SAP is not an easy task. There are many facets to consider. We cover these in the next sections.

See the following web page for more information about which hardware or combinations of hardware is supported by SAP:

http://service.sap.com/platforms

#### 3.4.1 Servers supported by SAP

SAP supports a variety of platforms for their software: Windows and UNIX, and also IBM System i and System z. SAP requires a special SAP certification for hardware platforms that run SAP applications, with a few exceptions such as SAP Business One. To be supported by SAP, every SAP software component, except the presentation tier, must run on SAP-certified platforms.

For UNIX-based servers (for example, AIX on System p), the operating system is subject to certification. Availability can be checked through the SAP product availability matrix<sup>3</sup>. For Windows and Linux the hardware has to be certified. In this section we describe the rules and how to determine which servers are supported.

The purpose and intentions of an SAP platform certification are as follows:

- To allow SAP to reference a list of reliable and standardized platforms when a customer requests that information
- To offer a service to SAP customers: Greater market transparency and a way to compare offers
- ► To deliver a performance indicator that can be publicly available and quotable
- To ensure that the SAP certified hardware platform is stable and scalable when implementing SAP solutions

Once certified, an SAP-certified hardware platform is subsequently supported for all SAP releases that are available for the Linux or Windows on an Intel/AMD platform combination, including all SAP approved databases.

#### Definitions

For the formal SAP hardware certification process, we define the following terms:

Processors, cores and threads are defined as specified by the TPC CPU working group. The definitions can be found at the following web page:

#### http://www.tpc.org

Under the CPU working group report from 15.08.2005, they are defined as follows:

Processor

A component that contains one or more cores. The number of processors claimed by the test sponsor must be consistent with the way the product is represented in the test sponsor's marketing collateral, including that which is not related to TPC benchmark results. The reported number of processors must be the number of processors that are enabled for the benchmark.

Core

Execution unit that is capable of running one or more processor threads. If a hardware unit can run more than one concurrent processor thread without requiring the processor threads to share execution resources, it is more than one core. It can rely on other assist units (such as cache, hardware accelerators, and so forth) some, or all, of which can be shared by multiple cores. The reported number of cores must be the number of cores that are enabled for the benchmark.

Execution unit

The electronic circuits necessary to implement the semantics of all possible instructions in computer architecture.

Processor thread

The hardware necessary to maintain the state of a software thread. The reported number of processor threads must be the number of concurrent processor threads that are enabled for the benchmark.

Software thread

An instruction sequence that performs operations within an address space and is scheduled by software.

<sup>&</sup>lt;sup>3</sup> See https://service.sap.com/pam

- ► A *hardware platform* is defined as follows:
  - By the processor family

Determined by the processor manufacturer, for example, Intel, AMD, the instruction set. Mere differences in processor speed or cache size is being considered as the same family.

a. By the chipset or the on-chip controller architecture, which includes all components that enable the data transfer between processor, memory and I/O.

External I/O (such as the storage adaptor or equivalent [Fibre Channel, RAID controller, and so forth]) and network access are not part of the platform definition.

A server family is formed by those servers that share the same hardware platform as defined. They are considered as one platform and do not depend on the type of physical construction (Blades, Towers, and so forth) or on the number of processors.

#### Server certification for SAP on Windows

All SAP technology partners that have a partner and support contract with SAP or technology partners that are accepted by any SAP regional or country branch can certify platforms for running SAP solutions on Microsoft Windows.

#### Server certification rules

The rules are as follows:

- The certified hardware must be listed within the Microsoft Hardware Compatibility List (HCL) for all Windows versions that are supported with this platform.
- ► SAP allows only 64-bit processors to be certified.
- I/O controllers supported by the hardware vendor for SAP solutions need to be declared within the certification. No separate certification is required for I/O adapters, storage, and other hardware components. Therefore, the vendor vouches for functionality and support of these components. Recommendations from hardware vendors are to be observed.
- SAP requires that the hardware vendors certify at least one system per server family. The certification of a server family must be completed on the largest system. The size of the system is defined by the largest number of processors, cores, and threads that are possible in the system. A certification includes all smaller systems. If questions arise, it must be clarified through the hardware certification workgroup.
- One benchmark must be completed to certify a server family. When the certification exists, new larger family members can be added to the certification without publishing a benchmark immediately. A new benchmark must be completed for the new or larger family member within six months of the date the new member was added. When no benchmark is completed for the announced members of the server family, the certification is revoked for all servers larger than the family member with a published benchmark.

**Note:** There are special rules for generic certifications for OEM hardware resellers (for example, reselling Intel white boxes), which we do not include here because they are not applicable for IBM servers.

The certification includes a performance indicator for the certified platform. The following tasks must be completed successfully:

- The tests consist of an SAP SD 2-tier, SD 3-tier or SD parallel standard application benchmark. The general SAP standard application benchmark<sup>4</sup> rules apply.
- ► Any Windows operating system and any database system that is released for the aforementioned SAP release, or will be released in the next 180 days, can be used.
- Minimum requirement for the 2-tier benchmark is 80% average processor use in the high load phase.
- On a 3-tier benchmark only the database server is certified.

#### Determining which servers are supported

After successful certification the certified systems are listed on the SAPonWin.com web site hosted by AddOn. You can look up certified IBM System x and BladeCenter systems on the following web page:

http://saponwin.com/pub/hardware.asp?l=vendor&sl=12&la=en

Or, go to the following web page and select Vendor of Certified Hardware  $\rightarrow$  IBM:

http://www.SAPonWin.com

The corresponding SD benchmark used for the certification is published on SAP's web site:

http://www.sap.com/benchmark

#### Server validation for SAP on Linux

**Note:** IBM offers Linux not only on System x, but also on Power Systems and System z. However, we limit the scope of this section to Linux on IBM System x.

It is essential that the vendors of the operating systems have a partner and support contract with SAP or at least have a support agreement with SAP. For Linux, SAP-supported vendors are Red Hat and Novell.

#### Server certification rules

The server certification rules are as follows:

- The certified hardware must be listed on the Red Hat Compatibility List (for Red Hat Enterprise Linux) or the Novell Hardware Compatibility List (for SUSE Linux Enterprise Server). For IBM servers, the hardware must be listed as supported for RHEL/SLES in the IBM ServerProven list.
- I/O controllers supported by the hardware vendor for SAP solutions need to be declared within the certification. No separate certification is required for I/O adapters, storage, and other hardware components; therefore the vendor vouches for functionality and support of these components. Recommendations from hardware vendors are to be observed. The certification is valid for all Enterprise Linux versions and releases from the mentioned Linux distributors as long as they are supported by SAP and the hardware vendor.
- SAP requires that the hardware vendors certify at least one system per server family. The certification of a server family must be completed on a representative system. The size of the system is defined by a reasonable number of processors (at least 4-way unless only 2-way is available by the vendor), and cores and threads that are possible in the system. If questions arise, they must be clarified through the hardware certification workgroup.
- The hardware vendor is fully responsible for providing support in case of any doubts related to the use of particular hardware with SAP.

<sup>&</sup>lt;sup>4</sup> See http://www.sap.com/benchmark

The certification consists of a set of tests to verify the stability of the certified platform. One of the following specifications must be completed successfully:

Minimum

At the least, the tests consist of functional tests representing an SAP implementation on-site at the customer location.

Recommended

The recommended tests can also consist of an SAP SD 2-tier, SD 3-tier or SD Parallel Standard Application Benchmark. The general SAP standard application benchmark rules apply. This benchmark does not have to be published. See the following web page for more information:

http://www.sap.com/benchmark

Best of Breed

The best tests include one or both of the tests mentioned in the previous two points plus many additional tests, such as I/O tests, ABAP sample reports and transactions, memory tests, and others as determined by the hardware partner to show the stability and reliability of the server family being certified.

For an easier and faster certification process, SAP has developed the SAP Certification Suite for Linux, which has been tested and approved for use by SAP, the hardware partners, and the Linux distributors.

Specifically, the vendor can use a Linux operating system and any database system that is currently released and certified for use with SAP. When the hardware vendor chooses to test using the SAP SD benchmark, the minimum requirement for the 2-tier benchmark is 80% average processor use in the high load phase.

#### Determining which servers are supported

IBM Systems x servers certified for SAP on Linux are listed in SAP note 171380 and on the SAP Linux web site:

#### http://www.sap.com/linux/

Go to this web page and select Supported Platforms  $\rightarrow$  Supported Hardware  $\rightarrow$  IBM  $\rightarrow$  IBM System x.

#### Server certification for SAP on Solaris

All SAP technology partners who have a partner and support contract with SAP or technology partners who are accepted by any SAP regional country branch can certify platforms for running SAP Solutions on Solaris x64. Servers with SPARC CPUs from Sun Microsystems and Fujitsu Siemens Computers are certified for SAP. They are not subject to the rules discussed in the following sections.

#### Server certification rules

Server certification for SAP on Solaris x86 follows the same rules as SAP on Windows, with the exception that the Benchmark used for certification does not have to be published. Of course the server does not have to be on the Windows HCL but on the Sun Solaris HCL available at the following web page:

http://www.sun.com/bigadmin/hcl/

The detailed rules are available at the following web page:

http://www.saponsolaris.com/rules.html

#### Determining which servers are supported

After successful certification the certified systems are listed on the SAPonSolaris.com web site hosted by \*xware. You can look up certified IBM System x and BladeCenter systems at the following web page:

http://www.SAPonSolaris.com/ibm.html

Or, go to the following web page, select Certified Hardware, and click the IBM logo:

http://www.SAPonSolaris.com

# 3.5 Hardware solution samples

The IBM SAP International Competence Center (see 5.2, "The IBM SAP International Competence Center" on page 72) prepares standard configurations for SAP solutions with IBM System x and BladeCenter systems. We cover the choices discussed in 3.4, "Choosing the right hardware" on page 34:

- 2-tier or 3-tier
- High availability or no HA
- Virtualized or non-virtualized
- Blade servers, rack mount server or tower servers

Consider these standard configurations as examples and not as the only valid solutions. They give examples of installations for 25 / 50 / 100 / 150 / 250 / 350 / 500 / 750 / 1000 users. The maximum capacity delivered by the machines is not limited to the number of users addressed, especially for the smaller configurations. For practical reasons and to avoid possible performance bottlenecks we typically recommend 2-way, and higher, servers even for small configurations.

The configurations consist of the following functional components:

- SAP Production System
- SAP Development System (for own development and SAP customizing)
- SAP QA System, also known as Test System (for mass test changes made in development)
- Disk storage (internal or external attached for all aforementioned systems)
- Backup devices (for example, tape device, to backup and restore vital SAP data and systems)
- FC SAN Switches (for larger, clustered setups)

Where applicable (that is, without negative functional impact) components have been physically consolidated.

The following assumptions have been made with respect to sizing:

- All users are active users implementing the SD module.
- ► All users are medium users implementing a 30-second think-time.
- 220 working days in a year.
- ABAP Unicode Instances are considered only.
- Estimated workload includes 32% for batch tasks (inclusive printing and reporting tasks).
- Storage calculations based on Microsoft Windows Server 2008 and each user creates 1.5 MB of data per day.
- A 12-month data retention period.
- ► Calculations are based on SAP Quicksizer output (SAP ECC 6.0 / SAP Basis 7.0).

There are two kinds of standard configurations for SAP available:

- The eX5 standard configurations for SAP use the rackmount and blade servers based on eX5 technology. Due to the powerful nature of these servers, the configurations are only available for 500 or 1000 users, and always use virtualization technology.
- The IBM and BladeCenter standard configurations for SAP make use of IBM System x and BladeCenter servers that are not based on eX5 technology.

#### Acquiring the standard configurations for SAP

IBM personnel can obtain the eX5 standard configurations for SAP, and the IBM System x and BladeCenter standard configurations for SAP in the "Papers" section of the following intranet page:

http://w3.ibm.com/sales/support/ShowDoc.wss?docid=JWKZ-5M9L4H&infotype=SK&infosubt
ype=W0

IBM Business Partners can get current standard configurations through the PartnerWorld® web site at the following web page:

https://www.ibm.com/partnerworld/mem/pat/pat\_sol\_sap\_hard\_x.html

Alternatively, IBM personnel and IBM Business Partners can contact the IBM SAP International Competence Center's InfoService through the following web page:

isicc@de.ibm.com

IBM customers can contact their IBM sales representative for current configurations.

# 4

# IBM System x, BladeCenter, and storage offerings

The IBM System x and BladeCenter portfolio for Windows and Linux is a valuable platform for implementing SAP applications. This chapter details the server offerings from IBM for SAP implementation. It also provides a brief review of the IBM System Storage® platform, which is an integral solution offered along with the IBM servers.

This chapter covers the following topics:

- 4.1, "IBM X-Architecture: An initiative" on page 42
- ▶ 4.2, "IBM eX5 technology" on page 43
- 4.3, "IBM System x and BladeCenter offerings for SAP" on page 51
- 4.4, "IBM System Storage solutions" on page 63

# 4.1 IBM X-Architecture: An initiative

In 2001, IBM introduced the X-Architecture for IBM servers, which took the IBM eServer<sup>™</sup> xSeries<sup>®</sup> range to a new level of performance. The IBM X-Architecture blueprint is a comprehensive approach to solving customer challenges. It embraces an evolving design approach to address tomorrow's challenges.

The IBM eX5 product portfolio represents the fifth generation of servers built upon Enterprise X-Architecture. See Figure 4-1. Enterprise X-Architecture is the culmination of bringing IBM technology, often derived from our experience in high end enterprise servers, to the x86 server market. And now with eX5, this scalable systems technology for Intel processor-based servers has also been delivered to blades and mid-sized x86 server systems. These servers can be expanded on demand, and configured using a building block approach that optimizes system design for your workload requirements.



Figure 4-1 The five generations of IBM X-Architecture

As a part of the IBM Smarter Planet<sup>™</sup> initiative, our dynamic infrastructure charter guides us to provide servers that improve service, reduce cost, and manage risk. These new servers scale to more CPU cores, memory, and I/O than previous systems, enabling them to handle greater workloads than the systems they supersede. Power efficiency and machine density are optimized, making them affordable to own and operate.

The ability to modify the memory capacity independently of the processors, and the new high speed local storage options means these system can be heavily used, yielding the best return from your application investment. These systems allow you to grow in processing, I/O, and memory dimensions, so you can provision what you need now, and expand the system to meet future requirements. System redundancy and availability technologies are more advanced than previously available in the x86 systems.

# 4.2 IBM eX5 technology

This section describes the technology that IBM brings to the IBM eX5 portfolio of servers. We first cover the latest generation of high-end Xeon processors from Intel, as there are significant architectural changes, which have an impact on the design of these systems. We next discuss the fifth generation of IBM Enterprise X-Architecture (EXA) chipsets, which we call eX5. This new chipset from IBM is the enabling technology for our unique ability to expand the memory subsystem independently of the rest of the x86 system. The IBM exclusive system scaling and partitioning capabilities is discussed; as is eXFlash, which allows us to increase system disk I/O dramatically using internal solid state storage instead of traditional disk based storage.

The section is laid out as follows:

- 4.2.1, "Intel Xeon 6500 and 7500 family processors" on page 43
- 4.2.2, "eX5 chipset" on page 47
- ▶ 4.2.3, "MAX5" on page 48
- ► 4.2.4, "Scalability" on page 48
- ▶ 4.2.5, "Partitioning" on page 49
- ► 4.2.6, "IBM eXFlash" on page 49

# 4.2.1 Intel Xeon 6500 and 7500 family processors

The IBM eX5 portfolio of servers use Xeon 6500 and Xeon 7500 processors to maximize performance. These processors are the latest in a long line of high-performance processors.

The Xeon 7500 family are the latest Intel scalable processors and can be used to scale to four or more processors. When used in the IBM x3850 X5, these servers can scale up to eight processors. They are also used in the HX5 servers to scale to four processors.

Table 4-1 compares the new Intel Xeon 6500 and 7500 with the Intel Xeon 5500 and 5600 processors that are available in other IBM servers.

Intel processor name	Xeon 5500	Xeon 5600	Xeon 6500	Xeon 7500
Used in	x3400 M2 x3500 M2 x3550 M2 x3650 M2 HS22 HS22V	x3400 M3 x3500 M3 x3550 M3 x3650 M3 HS22 HS22V	x3690 X5 HX5	x3690 X5 x3850 X5 x3950 X5 HX5
Intel development name	Nehalem-EP	Westmere-EP	Nehalem-EX	Nehalem-EX
Maximum processors per server	2	2	2	8 (system dependent)
CPU cores per processor	2 or 4	4 or 6	4, 6, or 8	4, 6, or 8
Last level cache (MB)	4 or 8 MB	8 or 12 MB	12 or 18 MB	18 or 24 MB
Memory DIMMs per processor (maximum)	9	9	16	16

Table 4-1 2 socket, 2 socket scalable, and 4 socket scalable processors

#### Hyper-Threading Technology

Intel Hyper-Threading Technology enables a single physical processor to execute two separate code streams (threads) concurrently. To the operating system, a processor core with Hyper-Threading appears as two logical processors, each of which has its own architectural state. Hyper-Threading Technology is designed to improve server performance by exploiting

the multi-threading capability of operating systems and server applications. Application types that make the best use of Hyper-Threading are virtualization, databases, email, Java, and web servers.

For more information about Hyper-Threading Technology, see the following web page:

http://www.intel.com/technology/platform-technology/hyper-threading/

#### Turbo Boost Technology

Intel Turbo Boost Technology dynamically turns off unused processor cores and increases the clock speed of the cores in use. For example, with six cores active, a 2.26 GHz 8-core processor can run the cores at 2.53 GHz. With only three or four cores active, the same processor can run those cores at 2.67 GHz. When the cores are needed again, they are dynamically turned back on and the processor frequency is adjusted accordingly. When temperature, power, or current exceed factory-configured limits and the processor is running higher than the base operating frequency, the processor automatically reduces the core frequency to reduce temperature, power, and current.

Turbo Boost Technology is available on a per-processor number basis for the eX5 systems. For ACPI-aware operating systems, no changes are required to take advantage of it. Turbo Boost Technology can be engaged with any number of cores enabled and active, resulting in increased performance of both multi-threaded and single-threaded workloads.

For more information about Turbo Boost Technology, see the following web page:

http://www.intel.com/technology/turboboost/

#### **Quick Path Interconnect (QPI)**

Earlier versions of the Intel Xeon processor were connected by a parallel bus to a core chipset, which functions as both a memory and I/O controller. The new Xeon 6500 and 7500 processors implemented in IBM eX5 servers include a separate memory controller to each processor. Processor to processor communications is carried over shared-clock, or *coherent* quick path interconnect (QPI) links, and I/O is transported over *non-coherent* QPI links through I/O hubs. This is shown in Figure 4-2 on page 45.



Figure 4-2 Figure 4-2 Quick path interconnect, as in the eX5 portfolio

In previous designs, the entire range of memory was accessible through the core chipset by each processor. This is called a *shared memory* architecture. This new design creates a non-uniform memory access (NUMA) system, in which a portion of the memory is directly connected to the processor where a given thread is running, and the rest must be accessed over a QPI link through another processor. Similarly, I/O can be local to a processor, or remote through another processor.

For more information about QPI, see the following web page:

http://www.intel.com/technology/quickpath/

#### Reliability, availability, and serviceability

Most system errors are handled in hardware, by the use of technologies such as error checking and correcting (ECC) memory. The 6500 and 7500 processors have additional reliability, availability, and serviceability (RAS) features due to their architecture:

Cyclic redundancy checking (CRC) on the QPI links

The data on the QPI link is checked for errors.

QPI packet retry

If a data packet on the QPI link has errors or cannot be read, the receiving processor can request the sending processor retry sending the packet.

QPI clock failover

In the event a clock failure on a coherent QPI link, the processor on the other end of the link can take over providing the clock. This is not required on the QPI links from processors to I/O hubs, as these links are asynchronous.

SMI packet retry

If a memory packet has errors or cannot be read, the processor can request the packet be resent from the memory buffer.

Scalable memory interconnect (SMI) retry

If there is an error on an SMI link, or a memory transfer fails, the command can be retried.

SMI lane failover

When an SMI link exceeds the preset error threshold, it is disabled, and memory transfers are routed through the other SMI link to the memory buffer.

New to the Xeon 7500 and 6500 processors is the machine check architecture (MCA), a RAS feature that has previously only been available for other processor architectures, such as Intel Itanium®, IBM POWER® and other reduced instruction set computing (RISC) processors, and mainframes. Implementation of the MCA requires hardware support, firmware support (such as found in the unified extensible firmware interface [UEFI]), and operating system support.

The MCA enables the handling of system errors that otherwise require the operating system to be halted. For example, if a dead or corrupt memory location is discovered, but it cannot be recovered at the memory subsystem level, and provided it is not in use by the system or an application, an error can be logged but the operation of the server can continue. If it is in use by a process, the application to which the process belongs can be aborted.

Microsoft, Novell, Red Hat, VMware, and other operating system vendors have announced support for the Intel MCA on the Xeon processors.

#### **Scalable Memory Buffers**

Unlike the Xeon 5500 and 5600 series, which use unbuffered memory channels, the Xeon 6500 and 7500 processors use scalable memory buffers in the system design. This reflects the workloads for which these processor were intended. The 6500 and 7500 processors are designed for workloads requiring more memory, such as virtualization and databases. The use of memory buffers allows more memory per processor, and prevents memory bandwidth reductions when more memory is added per processor.

#### I/O hubs

The connection to I/O devices (such as keyboard, mouse, and USB) and to I/O adapters (such as hard disk drive controllers, Ethernet network interfaces, Fibre Channel host bus adapters) is handled by I/O hubs, which then connect to the processors through QPI links.

The I/O Hub connectivity is shown in Figure 4-2 on page 45. Connections to the I/O devices are fault tolerant, as data can be routed over either of the two QPI links to each I/O hub. For optimal system performance in the four processor systems (with two I/O hubs), balance high throughput adapters across the I/O Hubs. For more information, refer to the I/O sections in the chapters for each of the eX5 systems.

#### Memory

The memory used in the eX5 systems is DDR3 SDRAM registered DIMMs. All of the memory runs at 1066 MHz or less, depending on the processor. Unlike the Xeon 5500 and 5600 processors, each with their single scalable memory interconnect (SMI), the 6500 and 7500 processors have two SMIs. Memory therefore needs to be installed in matched pairs.

For better performance, or for systems connected together, memory has to be installed in sets of four.

# 4.2.2 eX5 chipset

The members of the eX5 server family are defined by their ability to use the fifth generation of chipsets for Intel x86 server processors from IBM. IBM engineering, under the banner of Enterprise X-Architecture (EXA), brings advanced system features to the Intel server marketplace. Previous generations of EXA chipsets powered System x servers from IBM with scalability and performance beyond what was available with the chipsets from Intel.

The Intel QPI specification includes not only definitions for processor-to-processor, and processor-to-I/O hub communications, but also connections from processors to chipsets, such as eX5, referred to as *node controllers*.

To fully use the increased computational ability of the new generation of Intel processors, eX5 provides additional memory capacity and additional scalable memory interfaces (SMIs), increasing bandwidth to memory. eX5 also provides these additional RAS capabilities for memory:

- ► ChipKill
- Memory ProteXion
- Full Array Memory Mirroring

QPI uses a source snoop protocol, which means that a CPU, even if it knows another processor has a cache line it wants (the cache line address is in the snoop filter, and is in the shared state), must request a copy of the cache line and wait for the result to be returned from the source. The eX5 snoop filter contains the contents of the cache lines and can return them immediately.

Memory directly controlled by a processor can be accessed faster than through the eX5 chipset, but because the eX5 chipset is connected to all processors, it provides less delay than accesses to memory controlled by another processor in the system.

# 4.2.3 MAX5

MAX5 is the name given to the memory and scalability subsystems that can be added to eX5 servers. MAX5 for the rack-mounted systems (x3850 X5, x3950 X5, and x3690 X5) is in the form of a 1U device that attaches beneath the server. For the BladeCenter HX5, MAX5 is implemented in the form of a expansion blade that adds 30 mm to the width of the blade (the width of 1 extra blade bay).

Figure 4-3 shows the x3850 X5 with the MAX5 attached.



Figure 4-3 IBM System x3850 X5 with MAX5 (the MAX5 is the 1U unit beneath the main system)

*IBM eX5 Portfolio Overview: IBM System x3850 X5, x3950 X5, and BladeCenter HX5,* REDP-4650

http://www.redbooks.ibm.com/abstracts/redp4650.html

# 4.2.4 Scalability

As shown in Figure 4-4 on page 49, scalability is possible as follows:

Memory scaling

A MAX5 unit can attach to an eX5 server through QPI link cables. This provides the server with additional memory DIMM slots. We refer to this combination as a memory enhanced system.

System scaling

The x3850 X5, x3950 X5 and HX5 also support system scaling. Two servers can be connected together to form a single system image. The connections are formed using QPI link cables.

# 4.2.5 Partitioning

A two-node HX5 blade server can be made to operate as two independent systems, and a single system, without removing the the side-scale connector. This capability is called *partitioning*, also referred to as *IBM FlexNode* technology and is accomplished through the Advanced Management Module (AMM) in the IBM BladeCenter chassis.

Figure 4-4 depicts an HX5 system scaled to two nodes, and partitioned into two independent servers.



Figure 4-4 HX5 scaling and partitioning

The AMM can be accessed remotely, so partitioning can be done without touching the systems. Because the AMM can be accessed through command line interfaces and through a web browser, partitioning can be scripted, or controlled through a systems management utility (such as IBM Systems Director). Partitioning can allow you to qualify two system types with little additional work, and allows you more flexibility in system types, for better workload optimization.

# 4.2.6 IBM eXFlash

IBM eXFlash is the name given to the eight 1.8 inch solid state drives (SSDs), the backplanes, SSD hot swap carriers, and indicator lights that are available for the x3850 X5 and x3690 X5. Each eXFlash can be put in place of four SAS or SATA disks.

The eXFlash units connect to the same types of ServeRAID disk controllers as the SAS/SATA disks.

In addition to using less power than rotating magnetic media, the SSDs are more reliable, and can service many more I/O requests per second (IOPS). These attributes make them suited to I/O intensive applications (such as those that make complex queries of databases).



Figure 4-5 shows an eXFlash unit with the status light assembly on the left side.

Figure 4-5 x3850 X5 with one eXFlash

For more information, refer to the disk controller sections in the chapters for each of the eX5 systems.

# 4.3 IBM System x and BladeCenter offerings for SAP

IBM brings the comprehensive capabilities of SAP solutions to the System x and BladeCenter product line. System x servers bring unprecedented mainframe-inspired performance and availability to cost-effective Intel processor-based servers. IBM System x servers and BladeCenter take full advantage of the latest multi-core Intel processors to deliver new levels of performance and scalability for SAP solutions. The availability of the QPI-scaling features and the MAX5 memory and scaling extension enables the customer to accommodate both non-virtualized and virtualized large SAP solutions.

IBM has an extensive range of servers, ranging from two-way processor to four-way processor capable and beyond, using the Intel platforms to implement an SAP solution. Most of these servers are certified to run SAP solutions and offer industry leading benchmarks on SAP. Figure 4-6 shows the complete range of IBM System x servers that are certified to run an SAP solution.

**Important:** Not all server/operating system combinations are certified for production SAP systems. See 3.4.1, "Servers supported by SAP" on page 34 on how to check



Figure 4-6 System x and BladeCenter offerings for SAP

#### 4.3.1 eX5 systems

The high-performance scalable servers, all based on the eX5 Architecture, are the HX5 blade server, the x3850 X5 and the x3950 X5. They have a common set of technical specifications and features. There are three systems in the eX5 family:

- ► x3850 X5
- x3690 X5
- HX5 blade

Each of these models with additional memory by adding a Memory Access for eX5 (MAX5) memory unit to the server. In addition, the HX5, x3850 X5 and x3950 X5 can be scaled by connecting two together, which we call a 2-node system. See Figure 4-7.



Figure 4-7 eX5 family (top to bottom): BladeCenter HX5 (2-node), System x3690 X5, System x3850 X5

The IBM System x3850 X5 is a 4U highly rack-optimized server. The x3850 X5 also forms the basis of the x3950 X5, the new flagship server of the IBM x86 server family. These systems are designed for maximum utilization, reliability, and performance for compute and memory intensive workloads.

The IBM System x3690 X5 is a new 2U rack optimized server. This machine brings new features and performance to the mid tier.

The IBM BladeCenter HX5 is a single wide (30 mm) blade server that follows the same design as all previous IBM blades. The HX5 brings unprecedented levels of capacity to high density environments. The HX5 is expandable to a double-wide (60 mm) two-node server.

**Note:** For the latest information on the eX5 portfolio, refer to the IBM Redpaper *IBM eX5 Portfolio Overview: IBM System x3850 X5, x3950 X5, and BladeCenter HX5*, REDP-4650 for further eX5 family members and capabilities. This paper is updated as they are formally announced. The paper is available at the following web page:

http://www.redbooks.ibm.com/abstracts/rep4650.html

When compared to other machines in the System x portfolio, these systems represent the upper end of the spectrum, are suited for the most demanding x86 tasks, and can handle jobs that previously have been run on other platforms. To assist with selecting the ideal system for a given workload, we have designed workload-specific models for virtualization and database needs.

# IBM System x3850 X5 and x3950 X5

The new System x3850 X5 (Figure 4-8) offers improved performance and enhanced features including MAX5 memory expansion and workload optimized models to maximize memory, minimize costs, and simplify deployment.



Figure 4-8 IBM System x3850 X5 and x3950 X5

The x3850 X5 and the workload-optimized x3950 X5 are the logical successors to the x3850 M2 and x3950 M2, featuring the IBM eX4 chipset. Compared to previous generation servers, the x3850 X5 offers:

► Twice the memory capacity

Up to 64 DIMMS standard and 96 DIMMs with the MAX5 memory expansion per 4-socket server

Intel Xeon processor 7500 series

Exceptional scalable performance with advanced reliability for your most data-demanding applications

- Four times the SAS capacity with 8 HDDs and 300 GB 2.5" SAS drives or 1.6 TB of hot-swappable, RAID 5, with eXFlash technology
- Standard dual port Emulex 10 GB Virtual Fabric adapter
- 8-core, 6-core and 4-core processor options with up to 2.26 GHz (8-core), 2.66 GHz (six-core) and 2.4 GHz (four-core) speeds with up to 16 MB L3 cache
- ► Scalable to a two node system with 8 processor sockets and 128 DIMM sockets.
- ► 7 PCIe x8 high-performance I/O expansion slots to support hot-swap capabilities
- Optional embedded hypervisor

The x3850 X5 and the workload-optimized x3950 X5 are the logical successors to the x3850 M2 and x3950 M2, featuring the IBM eX4 chipset. The x3850 X5 and x3950 X5 both scale to four processors and 1 Terabyte (TB) of RAM. With the MAX5 attached, the system can scale to four processors and 1.5 TB of RAM. Two x3850 X5 servers can be connected together for a single system image with eight processors and 2 TB of RAM.

Table 4-2 compares the number of processor sockets, cores, and memory capacity of the eX4 and eX5 systems.

	Processor sockets	Processor cores	Maximum memory		
Previous generation servers (eX4)					
x3850 M2	4	24	256 GB		
x3950 M2	8	48	512 GB		
Next generation server (eX5)					
x3850 X5	4	32	1024 GB		
x3850 X5 two-nodes	8	64	2048 GB		
x3850 X5 with MAX5	4	32	1536 GB		

Table 4-2 Comparing the x3850 M2 and x3950 M2 with the eX5 servers

The IBM System x3850 X5 and x3950 X5 servers are built on the latest IBM X-Architecture with fifth-generation eX5 chipset design enhancements. They provide greater performance with higher use, throughput, and bandwidth for virtualization and enterprise applications (such as SAP). Their power-optimized, energy-smart design for enhanced performance per watt, advanced service and remote management capabilities for greater ease of use and improved productivity, easy upgrade path, and pay-as-you-grow expansion options help you maximize the benefits from your investment.

With their massive memory capacity and computing power the IBM System x3850 X5 and x3950 X5 rack-mount servers are the ideal platform for high memory demanding, high workload SAP systems, virtualized or non-virtualized. These systems enable you to run big SAP systems, or a big number of virtualized SAP systems on an Intel XEON-based platform using the Microsoft Windows Server or enterprise Linux operating systems.

# IBM System x3690 X5

The IBM System x3690 X5 (Figure 4-9) is a new 2U rack optimized server, bringing new features and performance to the mid tier.



Figure 4-9 IBM System x3690 X5

This machine is a 2U, two-socket, scalable system that offers a up to four times the memory capacity of current two socket servers.

It supports the following specifications:

- Up to two sockets for Intel Xeon 6500 or Xeon 7500 processors. Depending on the processor model, processors have four, six, or eight cores.
- Scalable from 32 to 64 DIMMs sockets with the addition of a MAX5 memory expansion unit.
- Advanced networking capabilities with a Broadcom 5709 dual Gb Ethernet controller standard in all models, an Emulex 10 Gb dual-port Ethernet adapter standard on models, optional on all others.
- Up to 16 hot-swap 2.5-inch SAS HDDs, up to 8 TB of maximum internal storage with RAID 0, 1, or 10 to maximize throughput and ease installation; RAID 5 optional; system comes standard with one HDD backplane that can hold four drives, a second and third backplane is optional for an additional 12 drives
- New eXFlash high-IOPS solid-state storage technology for larger, faster databases
- ► Five PCIe 2.0 slots
- Integrated Management Module (IMM) for enhanced systems management capabilities

The x3690 X5 with only two sockets can support as many virtual machines as older four socket servers due to having five times more memory than current two socket, x86-based servers. This leads to customer savings not just on hardware but software licensing as well.

The larger memory capacity of the x3690 X5 also offers leadership database performance. The x3690 X5 features the IBM eXFlash internal storage using solid state drives to maximize the number of I/O operations per second (IOPS).

The x3690 X5 is an excellent choice for memory- and performance-demanding business applications such as SAP. It provides maximum performance and memory for virtualization and database applications in a 2U package. It is a powerful and scalable system that allows workloads to migrate onto a two-socket design while delivering enterprise computing in a dense package.

#### IBM BladeCenter HX5

The IBM BladeCenter HX5 (Figure 4-10) brings the high performance and scalability to the BladeCenter. It is a scalable, high-performance blade server with unprecedented compute

and memory performance, and flexibility ideal for compute and memory-intensive enterprise workloads.



Figure 4-10 IBM BladeCenter HX5

It supports the following specifications:

- Optional memory expansion separates memory capacity from processors, enabling full use of license-constrained, memory-rich applications.
- Extremely dense design, with compute capacity of up to 16 processor cores in little more than .5U space, or up to 640 GB capacity in a 2.5U equivalent space with scalable memory expansion module.
- High-density, high-use computing allows superior price performance and performance per watt.
- Expansion capabilities from a two processor system (single-node) to a four processor system (two-node)
- Partitions a four processor blade to two two processor blades without requiring physical system reconfiguration
- Scalable from 16 to 40 DIMMs sockets with the addition of a MAX5 memory expansion unit (single-node only)
- Optional embedded hypervisor
- Mainframe-inspired reliability and automatic node failover for optimal system uptime
- Remote management from a single graphical console with IBM Systems Director

While the enhanced computing capacity facilitates more transactions per minute in a blade, the flexible node partitioning and pay-as-you-grow expansion offer great investment protection. In a virtualization environment, the HX5's greater memory capacity enables more or larger virtualized SAP systems per server.

Just as the rack-mount eX5 systems, the IBM BladeCenter HX5 is the right choice for demanding SAP workloads in a blade environment. Its unmatched memory capacity and expansion capabilities enable unprecedented performance and use in a blade form factor for database and virtualization.

#### 4.3.2 Other recommended systems

Apart from the high-end eX5-based systems, IBM offers other servers that are also suitable for the implementation of SAP software. We describe a few of them in this section.

# IBM System x3650 M3

The IBM System x3650 M3 (Figure 4-11) provides outstanding performance for your mission-critical applications (such as SAP). Its energy-efficient design supports more cores, memory, and data capacity in a space-saving 2U package that is easy to service and manage. With more computing power per watt and the latest Intel Xeon processors, you can reduce costs while maintaining speed and availability.



Figure 4-11 IBM System x3650 M3

It supports the following specifications:

- Up to two 3.33 GHz six-core (3.46 GHz four-core) Intel Xeon 5600 series processors with QuickPath Interconnect technology, and up to 1333 MHz memory access speed.
- ► Up to 192 GB high-performance DDR-3 memory
- ► Internal storage flexibility with up to 16 2.5-inch hot-swap SAS/SATA HDDs or SSDs
- Power-optimized performance that uses the speed of new Intel processors with more capacity and memory
- ► Innovative, energy-smart 2U design to help lower operational costs
- Up to four PCIe slots
- Optional 2 GB USB key for virtualization, containing VMware ESXi 4.0 embedded hypervisor

The IBM System x3650 M3 is the workhorse server for small to medium SAP implementations. With its large local storage capacity this rack-mount server is the ideal platform for smaller 2-tier SAP systems, or for sandbox, test, and development systems. It complements the eX5 systems described in 4.3.1, "eX5 systems" on page 51 to the lower end.

Table 4-3 gives a comparison of the main features of the rack-mount eX5 systems and the x3650 M3.

Maximum configurations		x3850 X5 / x3950 X5	x3690 X5	х3650 МЗ	
Processors	1-node	4	2	2	
(with or without MAX5)	2-node	8	4	-	
Memory DIMMs	1-node	64	32	18	
	1-node with MAX5	96	64	-	
	2-node	128	-	-	
Maximum memory	1-node	1024 GB	512 GB	144 GB	
	1-node with MAX5	1536 GB	1024 GB	-	
	2-node	2048 GB	-	-	

Table 4-3 The rack-mount eX5 systems compared to IBM System x3650 M3

Maximum configurations		x3850 X5 / x3950 X5	x3690 X5	х3650 МЗ
Disk drives (non-SSD)	1-node	8	16	16
(with or without MAX5)	2-node	16	-	-
Solid state disks	1-node	16	24	16 (no eXFlash)
	2-node	32	-	-
Standard 1 Gb Ethernet interfaces	1-node	2	2	2
	2-node	4	-	-
Standard 10 Gb Ethernet interfaces <sup>a</sup>	1-node	2	2	0
	2-node	4	-	-

a. Depends on the model

#### **Blade servers**

All IBM BladeCenter chassis allows you to choose from 2-processor and 4-processor offerings featuring high performance Intel Xeon Processors or AMD Opteron processors. These servers feature an exceptional power management with integrated tools such as IBM Systems Director Active Energy Manager<sup>™</sup>. The IBM Integrated Management Module (IMM) enables complete control and remote presence. It is equipped with light path diagnostics and Predictive Failure Analysis to detect component failure before the failure occurs. The blades are designed for maximize availability. All blades servers are supported for all BladeCenter enterprise and office chassis.

The blade server family includes the following servers that are especially relevant for SAP implementations.

#### IBM BladeCenter HS22

The HS22 blade server (Figure 4-12) features high performance Intel Xeon multi-core processors and up to 96 GB of RAM in 12 DIMM slots.



Figure 4-12 IBM BladeCenter HS22

It supports the following specifications:

- ► Two Intel Xeon 5600 series processors, up to 3.06 GHz
- ► Up to 96 GB of memory with 12 VLP DDR-3 memory DIMMs
- 1 CIOv slot (standard PCIe daughter card) and 1 CFFh slot (high-speed PCIe daughter card)

- ► Two optional 2.5" hot-swap SAS HDDs or solid-state drives
- RAID 0, 1, and 1E (optional RAID 5 with battery-backed cache)
- Optional embedded hypervisor enables instant virtualization
- Dual Gigabit Ethernet ports integrated on the blade.
- More performance, more energy efficiency and lower cost to run the most demanding applications

With significant processor and memory capacity, the HS22 is an ideal solution for SAP Application server, SAP portal server or SAP test system. It has a strong presence in the collaboration, Linux cluster, citrix and compute-centric application environment.

Visit the following web page for more information about the IBM BladeCenter HS22:

http://www.ibm.com/systems/bladecenter/hardware/servers/hs22/index.html

#### IBM BladeCenter HS22V

The IBM BladeCenter HS22V (Figure 4-13) is a two-socket blade server running the latest Intel Xeon processors with a memory capacity of up to 144 GB with 18 DIMM sockets. It is ideal for virtualization and memory-demanding SAP applications.



Figure 4-13 IBM BladeCenter HS22V

It supports the following specifications:

- Two Intel Xeon 5500 or 5600 series processors, supports advanced, standard, basic, and low voltage
- Generous memory capacity of up to 144 GB with 18 VLP DDR3 memory DIMMs supports more and larger virtual machines than prior generation blades
- Delivers superior energy efficiency with tools such as IBM Systems Director Active Energy Manager, power capping and solid-state drives and energy-efficient DDR3 memory
- Optional embedded hypervisor enables instant virtualization
- Support for up to two 1.8" solid-state drives
- RAID 0, 1, and 1E (optional RAID 5 with battery-backed cache)
- 1 CIOv slot (standard PCIe daughter card) and 1 CFFh slot (high-speed PCIe daughter card)
- Dual Gigabit Ethernet ports integrated on the blade.

The extended memory capacity and powerful processors make the HS22V an ideal solution for virtualized SAP Application servers or database servers.

More information about this blade server can be found in the IBM Redpaper *IBM BladeCenter HS22V Technical Introduction*, REDP-4647.

The HX5 blade server described in 4.3.1, "eX5 systems" on page 51 can exceed the capabilities of the HS22. The HS22V has more memory in a single wide blade, but the HX5 can be scaled by adding another HX5.

Table 4-4 compares these blades.

Table 4-4	HS22,	HS22V,	and HX5	comparison
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	Processor sockets	Processor cores	Maximum memory			
Comparative servers	Comparative servers					
HS22 (30 mm)	2	12	96 GB			
HS22V (30 mm)	2	12	144 GB			
Next generation server (eX5)						
HX5 (30 mm)	2	16	128 GB			
HX5 two-node (60 mm)	4	32	256 GB			

#### 4.3.3 IBM BladeCenter chassis

IBM BladeCenter is designed on IBM Enterprise X-Architecture Technology. It plays an integral role in your SAP environment and can integrate SAP applications and database servers, storage, and networking to help you reduce complexity, simplify IT management, and reduce costs through a flexible and highly scalable design. IBM BladeCenter is the ideal platform to consolidate the typical multi-server landscape of an SAP environment.

The BladeCenter chassis is a high-density, high-performance, rack-mounted server system designed for enterprise growing applications. A BladeCenter can typically accommodate 14 two-way blade servers. It provides common resources such as power supply, management modules, network interfaces, cooling, and I/O resources (such as diskette drive, CD-ROM, keyboard, mouse, USB ports, video ports, and so forth). These resources are shared by the blade servers installed in the chassis. This ensures that BladeCenter is the ideal solution for deployment in environments that require a large number of servers to be installed in a small space with minimal cabling. IBM BladeCenter supports a wide selection of processor technologies and operating systems to allow customers to run their choice of applications.

The IBM BladeCenter Solution is designed around industries having differing design requirements. There are five chassis in the BladeCenter family. BladeCenter E, BladeCenter H and BladeCenter S are described here. They are suited for most customers. BladeCenter T and BladeCenter HT are for customers in the telecommunications industry and customers needing a rugged solution.
	BladeCenter S	BladeCenter E	BladeCenter H
Benefits	All-in-one chassis with integrated SAN, ideal for small offices and distributed environments	Energy-efficient, high-density chassis ideal for space and power-constrained data centers	High-performance and high-density chassis ideal for even the most demanding applications
Best in class environments	Standard office	Space- and power-constrained	High-performance high-density
Rack form factor	7U	7U	9U
Blade bays	6 blade bays, plus 2 disk storage module bays and up to 12 3.5" HDD bays	14	14
Number of switch fabrics	Up to four	Up to four	Up to four standard, four high-speed, four bridge
Power supply modules	950W/1450W AC	Up to four 2000W or 2320W AC	Up to four 2900W AC
Systems management controller	Advanced Management Module (AMM)	Up to two AMMs	Up to two AMMs

 Table 4-5
 BladeCenter chassis at a glance (without T and HT variants)

## **IBM BladeCenter E Chassis**

The IBM BladeCenter E chassis (Figure 4-14) offers high density at the lowest cost. It is extremely power efficient with consolidated management features. The BladeCenter E chassis is ideal for web hosting, and web serving, colloboration, financial, and retail environments.



Figure 4-14 IBM BladeCenter E Chassis

It supports the following specifications:

- 7U rack optimized mechanical housing to accommodate up to 14 two-way blade servers, thus allowing you to have 84 blade servers in an industry standard 42-U rack.
- Up to four hot-swap and redundant Gigabit Ethernet or Fibre Channel switch modules can be integrated.
- The BladeCenter E chassis can accommodate up to four hot-swap 2000W power supply modules.
- The high availability backplane ensures maximum uptime and provides investment protection for future technologies.
- The chassis can accomodate up to two management modules with KVM in redundant mode.

## **IBM BladeCenter H Chassis**

IBM BladeCenter H (Figure 4-15) delivers increased performance and many new capabilities to the BladeCenter family while maintaining compatibility with the BladeCenter family of options. BladeCenter H offers added performance capabilities of the 4x InfiniBand-capable fabrics, large power supplies, and a more robust thermal solution. It is an ideal platform to run the next generation high-performance business-critical applications such as technical clusters and virtualized enterprise solutions.



Figure 4-15 IBM BladeCenter H Chassis

It supports the following specifications:

- ▶ It has a 9 U rack mount chassis to accomodate 14 two-way capable blade servers.
- Can be populated with four hot-swappable Gigabit Ethernet or two Gigabit Ethernet and two Fibre Channel switches. It additionally can accomodate up to four high-speed modules and up to four bridge modules.
- It accommodates up to four hot-swap 2900W power supply modules which supports load balancing and fail-over features.
- ► IBM BladeCenter H is designed to provide bridge support for high speed InfiniBand switch.
- The high availability backplane with high speed fabric enabled, ensures maximum uptime and provides investment protection for future technologies.
- ► The chassis can accomodate up to two management modules in a redundant mode.
- The chassis additionally has provision for serial connection to each blade server installed in the chassis for those serial port enabled application support.

**Note:** The Serial connection available in BladeCenter H works only with the newer series of blade servers supporting serial wiring connection.

## **IBM BladeCenter S Chassis**

The BladeCenter S chassis (Figure 4-16) makes it easy and cost-effective for small and midsized businesses to obtain IT results at levels traditionally reserved for large enterprises. With six blade servers, and a fully integrated Storage Area Network (SAN), the chassis plugs into an average wall socket, eliminating the need to own and operate costly data centers. BladeCenter S storage and networking options are integrated into the chassis to simplify infrastructure complexity and manageability while helping lower total cost of ownership.



Figure 4-16 IBM BladeCenter S Chassis

It supports the following specifications:

- ► Integrates servers, SAN storage, networking, I/O and applications into a single chassis
- Uses standard office power plugs with 100–240 V, so you do not need a data center to take command of your data
- Featuring the BladeCenter Start Now Advisor, making it easy to set up servers, SAN storage, network switches and SAN switches, all from a single console
- Flexible modular technology integrates Intel, AMD Opteron, or POWER processor-based blade servers supporting a wide range of operating systems
- Comes with management tools that are open and easily integrated, allowing you to focus on your business, not your IT
- ► Helps build greener IT infrastructures with powerful IBM Cool Blue<sup>TM</sup> technology, and a portfolio of products and tools to help customers plan, manage and control power and cooling.

## 4.4 IBM System Storage solutions

The IBM comprehensive approach to SAP system storage needs addresses the requirements for high performance, scalability, maximum security, reliability, and low total cost of ownership. IBM also recognizes the importance of sharing data across platforms to reduce data duplication, increase data availability, and improve network response time.

IBM System Storage service offerings for SAP solutions include the following:

- Virtualization solutions from IBM to help improve flexibility in the storage infrastructure.
- ► The IBM System Storage Toolkit for Administrators helps simplify and automate the process of optimizing an IBM System Storage DS8000<sup>®</sup> or DS6000<sup>™</sup> -based storage system.
- IBM FlashCopy® solutions are designed to handle large volumes of business-critical data and help SAP customers maintain high application-server availability to help minimize the impact on revenue-generating applications. Working with SAP, IBM has tested several backup/recovery and high availability scenarios designed to maintain data consistency and minimize user downtime.

## 4.4.1 SAP customer requirements

Whether they operate in retail, finance, pharmaceuticals or many other vertical markets, today's competitive businesses depend on SAP to run many of their core operational processes—procurement, sales, finance, customer relationship management, and supply chain management to name just a few.

Applications such as SAP ERP give managers enterprise-wide visibility and control. With the increasing complexity of enterprise software systems, however, comes an ever-growing pool of data that must be kept secure and available 24 hours, 7 days a week. SAP addresses this challenge by running on a 2-tier or 3-tier architecture with servers running the applications and a dedicated server for the database. Additional specialized servers often run backup and recovery operations, such as IBM Tivoli Systems Management and Tivoli Storage Management.

Above all, SAP customers need storage solutions that maximize performance while keeping implementation and maintenance costs down.

At the storage infrastructure level, SAP and IBM work together in two ways:

- Through established interpretability programs
- Through jointly developed SAP-specific service offerings

IBM is an SAP Global Services Partner, Global Technology Partner, and Global Hosting Partner. Many of the IBM storage solutions have been certified with SAP:

- ► IBM System Storage DS8000 series, DS6000 series, XIV®, DS5000 series, DS4700, DS3400 or DS3200 Server
- SAN Volume Controller
- ► IBM Linear Tape-Open (LTO)
- IBM Tivoli Storage Manager
- ► IBM Tivoli Access Manager
- ► IBM Tivoli Identity Manager
- ► Tivoli Workload Scheduler for Applications
- ► IBM DB2 Universal Database™
- IBM DB2 CommonStore

The potential results for customers include low integration costs and fast solution deployment. Numerous SAP solutions have been tested with IBM storage solutions, including the full SAP Business Suite, and applications such as SAP ERP and SAP Advanced Planning and Optimization and SAP.

More information about IBM System Storage Solutions for SAP can be found at the following web page:

http://www.ibm.com/systems/storage/solutions/isv/#sap

## 4.4.2 High-end and enterprise disk

High-performance disk storage for business-critical enterprise workloads include the following systems:

## **IBM System Storage DS8000**

The IBM System Storage DS8000 (Figure 4-17) Turbo offers high-performance, high-capacity, secure storage systems that are designed to deliver resiliency and total value for the most demanding, heterogeneous storage environments.



Figure 4-17 IBM System Storage DS8000

It sets high standards for performance, automation, and integration in data-intensive environments. Components of the DS8000 series include a high-bandwidth and fault-tolerant design Fibre Channel interconnect, an expandable, flexible cache with performance optimization capabilities, and Fibre Channel attached disk technology. The series is designed to scale from 1.1 Terabyte to more than 1 Petabyte.

With virtualization functions, powerful data backup, and remote mirroring and recovery functions, the DS8000 can help allocate system resources to maximum advantage while boosting backup and data recovery capabilities. The system also accommodates nondisruptive microcode changes, which increases data availability and overall flexibility.

### **IBM XIV Storage System**

IBM XIV Storage System is a ground-breaking, high-end, open disk system designed to support business requirements for a highly available information infrastructure. The XIV architecture is a grid of standard Intel/Linux components connected in any-to-any topology by means of massively paralleled, non-blocking Gigabit Ethernet, providing outstanding enterprise-class reliability, performance, and scalability.

### **IBM System Storage DS6000**

The IBM System Storage DS6000 series (Figure 4-18) is designed to provide high availability and high performance in a small, modular package. This series, along with the DS8000 series, offers an enterprise-class continuum of storage systems with shared replication services and common management interfaces.



Figure 4-18 IBM System Storage DS6000

A second option for mid-size and large businesses is the DS6000 series, which offers cost-effective and space-efficient enterprise functionality. The IBM System Storage DS6000 series is designed to provide high availability and high performance in a small, modular package. This series, along with the DS8000 series, offers an enterprise-class continuum of storage systems with shared replication services and common management interfaces. The DS6000 relies on the core functional code of the DS8000 and intuitive, web-based interfaces to help simplify data management and protect and recover data. It supports a variety of mainframe and open systems at a variety of price/performance levels.

The DS8000 and DS6000 series are grounded in a sophisticated architectural strategy that helps IBM continually demonstrate technology leadership at competitive prices. The architecture provides the solid foundation to deliver advanced functions and, ultimately, business continuance and efficiency.

The defining attributes of the DS8000/DS6000 are as follows:

Platform for consolidation

The DS8000/DS6000 provides an attractive platform not only for large applications but also for large-scale storage consolidation encompassing multiple hosts and applications.

Self-healing facilities

A comprehensive approach to maintaining continuous access to SAP data requires more than just redundancy and support for concurrent system changes. Advanced features in the DS8000/DS6000 can help boost data availability during day-to-day operations, and during unanticipated events:

- Fault-tolerant hardware design with redundancy for all major components such as disk drives, data paths, logic components, power supplies and cache.
- Comprehensive error detection and correction facilities
- RAID protection
- IBM Predictive Failure Analysis
- Calls home feature to order parts or report a problem often before anyone detects it.
- System upgrades to increase disk capacity or cache size, addition of host attachments, many repairs concurrently with DS8000/DS6000 online operation.
- Various configuration changes possible dynamically by the customer at any time and usually without vendor involvement.
- Design for high performance

DS8000/DS6000 is designed to deliver high performance from the SAP application point of view. Two features enhance performance of the DS8000/DS6000:

- a large read-write cache
- a stripe-all design
- Attractive total cost of ownership (TCO)

Unlike many other vendors, IBM does not impose onetime charges for many essential features, including basic configuration management and multi-path host I/O drivers.

A selection of disks of different RPM and capacities helps optimize system price/performance and price/capacity. A high-performance RAID 5 configuration option allows customers to achieve cost and scalability benefits of RAID 5 that are not possible with conventional mirroring designs. For SANs, each Fibre Channel port can be shared by multiple heterogeneous hosts and Host Bus Adapter (HBA) cards, potentially reducing the number of ports needed.

## 4.4.3 Mid-range disk storage

Mid-range disk storage products for an on-demand world include:

#### IBM System Storage DS5020 Express

In a continuing effort to provide storage solutions that are designed to provide low total cost of ownership, high performance, robust functionality, and unparalleled ease of use, IBM offers the IBM System Storage DS5020 Express. As part of the DS series, the DS5020 Express offers high-performance 8 Gbps capable Fibre Channel connections, optional 1 Gbps iSCSI interface for less demanding applications and lower cost implementation, up to 67.2 TB of Fibre Channel physical storage capacity, up to 112 TB of SATA physical storage capacity.

The DS5020 is a 3U rack-mountable enclosure, has four 8 Gbps FC drive interfaces and can comprise of a maximum of six EXP520 expansion units for a total of up to 112 disk drives. Through a specific activation feature six EXP810 expansions can be used in place of theEXP520s thus enabling investment protection.

### **IBM System Storage DS5000 Series**

The DS5000 series is designed to meet today's and tomorrow's demanding open-systems requirements while establishing a new standard for life cycle longevity with field-replaceable host interface cards.

IBM System Storage model DS5100 and DS5300 offer high performance 4 and 8 Gbps Fibre Channel and 1 Gbps iSCSI connections to the Host and 4 Gbps FC drive interfaces to the EXP5000 and EXP810 (for migration purposes only) expansion units. Both cansupport up to 448 disk drives through 6 EXP5000 Expansion drawers offering 268 TB FC or 448 TB SATA of physical storage capacity. Furthermore they can support up to 8 EXP5060 High density drawers which allows to offer 480 TB of physical storage.

DS5100 can have the same performance as the DS5300 using the option of enhanced performance key, so technically there is no difference. The difference is within the price setting. The DS5100 starts at a far more lower price than the DS5300, but after full transition to a DS5300 it ends up with just a fraction higher price than an original DS5300.

## 4.4.4 Entry-level disk

Designed to deliver advanced functionality at a breakthrough price, these systems provide an exceptional solution for workgroup storage applications such as email, file, print and web servers, and collaborative databases and remote boot for diskless servers.

#### IBM System Storage DS3200

The IBM System Storage DS3200 Express is an external storage enclosure specifically designed for the SMB. With SAS host interface, next generation SAS back-end technology, and SAS and SATA drive intermix support, The DS3200 addresses the top concerns of these businesses managing increasing demand for capacity, data availability, and functionality.

### IBM System Storage DS3300

The IBM System Storage DS3300 Express is an external storage system specifically designed for a range of organizations' data requirements. With iSCSI protocol, next-generation SAS back-end technology, and SAS and SATA drive intermix support, the DS3300 Express storage system provides businesses with robust, reliable, and cost-effective networked storage.

## IBM System Storage DS3400

The IBM System Storage DS3400 Express is a FC host-based external storage system specifically designed for a wide range of organizations. With FC interface technology, next-generation SAS back-end technology, SAS and SATA drive intermix support, and DS3000 Storage Manager software, the DS3400 storage system provides businesses with robust, reliable, cost-effective FC networked storage.

#### IBM System Storage EXP3000

IBM System Storage EXP3000 Features 3 Gbps SAS interface technology. It has support for up to 5.4 TB of SAS disk physical storage capacity (450 GB SAS drives) in a single enclosure.

## 4.4.5 IBM System Storage N series

The IBM Storage System N series provides a range of reliable, scalable storage solutions to meet storage requirements of a customer. It uses network access protocols such as NFS, CIFS, HTTP and iSCSI and Storage Area technologies such as Fibre Channel to achieve this. It has built-in RAID-DP<sup>™</sup> and RAID4 technologies to ensure that the customer data is well protected. To further use on this protection, one can implement mirroring, replication, snapshot and backup options. N series network storage is easy to install, manage, administer, and troubleshoot, thus making it an ideal choice for data storage.

## 4.4.6 IBM System Storage SAN Volume Controller

The IBM System Storage SAN Volume Controller (SVC) (Figure 4-19) is designed to combine storage capacity from multiple disk systems into a reservoir of capacity that can be managed more efficiently. It is designed to help increase storage utilization, thus reducing costs, by providing host applications with more flexible access to capacity. Designed also to help improve storage administrator productivity by automating provisioning and enabling management of heterogeneous storage systems using a simple common interface. The objective is to identify all storage resources in your IT infrastructure, to integrate it and to provide a virtualized interface to all of your storage capacity. With SVC you can do it quickly, efficiently, in real time, while avoiding administrative cost.



Figure 4-19 IBM System Storage SAN Volume Controller

SVC supports improved application availability by practically eliminating storage-related causes of application downtime. SVC also enables a tiered storage environment in which the cost of storage can be better matched to the value of data. These are just a sample from the range of features and benefits provided by SVC.

#### **IBM SVC Entry Edition**

Small and medium businesses looking for the benefits of storage virtualization can consider the IBM System Storage SAN Volume Controller (SVC) Entry Edition. SVC Entry Edition can simplify management of storage while improving storage utilization, and it can grow with your business by converting easily to the full SAN Volume Controller offering.

#### **IBM SVC Entry Edition**

Small and medium businesses looking for the benefits of storage virtualization can consider the IBM System Storage SAN Volume Controller (SVC) Entry Edition. SVC Entry Edition can simplify management of storage while improving storage utilization, and it can grow with your business by converting easily to the full SAN Volume Controller offering.

More information about the SAN Volume Controller is available from the following web page:

http://www.ibm.com/systems/storage/software/virtualization/svc/

In addition, see *Implementing the IBM System Storage SAN Volume Controller V5.1*, SG24-6423 available from the following web page:

http://www.redbooks.ibm.com/abstracts/sg246423.html

### 4.4.7 Value added options

IBM offers various other tools such as backup devices and software, to enable a customer to implement a turnkey solution to meet its IT challenges. Some of these are defined in the sections that follow.

#### **Linear Tape-Open Libraries**

IBM Linear Tape-Open (LTO) Libraries are designed to enable SAP administrators to archive and protect mission-critical data. Field-proven autoloaders are designed to offer exceptional data and media reliability along with logical library partitioning that can help improve configuration flexibility.

#### Tivoli storage management software

IBM Tivoli storage management software is designed to automate backup and restore processes to help maximize the integrity and availability of e-business data. IBM Tivoli Storage Manager (TSM) assists with backups, archiving, data recovery, and cloning. With TSM for Enterprise Resource Planning you can improve the availability of your SAP database servers and reduce your administration workload with automated data protection designed for SAP environments.

For more information about IBM Tivoli Storage Manager for Enterprise Resource Planning see the following web page:

#### http://www.ibm.com/software/tivoli/products/storage-mgr-erp/

TSM for Advanced Copy Services integrates Flash-Copy backup into SAP, providing backup within seconds. Currently being only available for AIX only it is planned to be supported for Windows and Linux within 2007 and thus can be available by the time of your reading. You can find more information about TSM for Advanced Copy Services, including availability, from the following web page:

http://www.ibm.com/software/tivoli/products/storage-mgr-advanced-copy-services/

#### **Storage Area Network Switches**

IBM SAN switches enable storage servers to be configured into high-performance storage area networks (SAN) for greater flexibility to respond to changing business needs. You can deploy SAN fabrics at the departmental and data center levels and interconnect these as the requirements change.

5

## The IBM advantage

In the previous chapters, we discussed SAP and its offerings, the IBM and SAP synergy, and the IBM offerings on SAP. This chapter describes the advantages of IBM and SAP partnership and the core strength of IBM System x and BladeCenter offerings on SAP.

In this chapter, we discuss the following topics:

- ► 5.1, "SAP International Competence Centers" on page 72
- ► 5.2, "The IBM SAP International Competence Center" on page 72
- ► 5.3, "IBM Global Business Services" on page 74
- ► 5.4, "Insight from IBM: Optimal use of resources" on page 74
- 5.5, "SAP NetWeaver Business Warehouse (BW) Accelerator and the IBM solution" on page 75
- ► 5.6, "SAP Discovery System" on page 76
- 5.7, "MAX5" on page 77
- ► 5.8, "IBM Systems Director" on page 78
- 5.9, "Active Energy Manager" on page 78
- ► 5.10, "SAP with Tivoli integration" on page 79
- ▶ 5.11, "Summary" on page 80

## 5.1 SAP International Competence Centers

International Competence Centers (ICCs) are the central interface between SAP and partners, to provide briefings, best practices, and recommendations for customer implementations.

ICCs were founded to increase the compatibility between SAP software and the selected partner's hardware, databases, and technologies.

For over 30 years, IBM and SAP have combined services, technologies, and applications to help several thousand of our clients worldwide implement successful SAP projects. IBM employs over 10,000 SAP practitioners in 80 countries, with an average of nine years of hands-on SAP experience across the team. The IBM global SAP implementation capabilities offer a full breadth of services, including consulting, infrastructure and applications, in-depth support, and operational and management processes.

SAP business solutions (SAP Business Suite and the new generation of cross-functional applications, SAP xApps) are empowered by SAP NetWeaver, which offers full interoperability and extensibility at all levels of integration. This openness is essential, and provides our customers the groundwork for mastering a high degree of system heterogeneity.

Each company has direct communications and links into each other's development, sales, and consulting teams to promote joint and cohesive solutions and provide leadership on software interoperability topics.

## 5.2 The IBM SAP International Competence Center

Founded in 1993, located at SAP Headquarters in Waldorf, Germany, the IBM SAP International Competence Center (ISICC) is a central point of access for IBM and SAP projects.



Figure 5-1 shows how the ISICC is central to the IBM partnership with SAP.

Figure 5-1 The ISICC is the center of the alliance

Customers, IBM Business Partners and IBM employees around the globe can benefit from the services that the IBM SAP International Competence Center provides:

Customer briefings and events

The ISICC offers Executive Customer Briefings, a full day event for a single customer with a tailored agenda ensuring the unique demands of the customer are met.

Workshops or Infodays are offered to provide customers and IBM Business Partners a forum for discussing new challenges and exchanging information with industry experts (for example, Business Partner Boost Program, Lotus Business Partners, Dynamic Infrastructure, and so on). Education classes on hot topics for Business Partners and IBM are offered at the ISICC as well (for example, Sizing classes, DB2 for SAP Business One, Portal Interoperability, and so on).

► ISICC InfoService

The ISICC InfoService is a managed question and answer (Q&A) service that the ISICC provides to IBM, SAP, IBM Business Partners, and customers. It provides a single point of contact for all SAP related questions, leveraging a worldwide network of experts on technology topics.

This key support function in the alliance handled more than 5000 requests in 2009, with a target to answer more than 80% of all requests within one working day.

To contact ISICC InfoService, send an email to isicc@de.ibm.com, or call +49-6227-73-1099 (Monday through Friday, 9 am to 5 pm CET, except local holidays).

SAP solution sizing

The ISICC is responsible for the sizing guidelines for SAP solutions on IBM infrastructure, covering the growing complexity of SAP solution landscapes. It provides conceptual guidance ensuring fulfillment of customer requirements, fine tuning and tailoring.

The ISICC acts as third level sizing and configuration support. IBM employees and IBM Business Partners should contact IBM Techline to get SAP sizing support. Customers should approach their IBM or IBM Business Partner representative.

Technology enablement

The ISICC has the expertise to create solutions around the latest products and technology from SAP and IBM. As a result, the ISICC publishes technical white papers, how-to guides, and other technical documentation. A lot of these documents are found on the IBM Techdocs repository, in the IBM PartnerWorld web sites (IBM Business Partners only) or IBM internal web sites (IBM employees only). ISICC members are also involved in many SAP related IBM Redbooks publications.

Making use of its expertise, the ISICC provides Technical Education Support, and second level technical support (including Escalation Management and Technical Q&A Support). Additionally, SAP server certification for IBM systems (see 3.4.1, "Servers supported by SAP" on page 34) is handled at the ISICC.

IBM and SAP partnership

Being the heart of the IBM SAP alliance, joint IBM and SAP marketing initiatives, solution development, and events are driven from the ISICC.

Marketing and sales enablement

This ISICC also plays an important role in SAP/IBM marketing coordination, creation of sales and marketing materials, client references, and sales education support.

Figure 5-2 shows the integration process between the IBM SAP International Competence Center (ISICC) and other areas.



Figure 5-2 Integration between ISICC and IBM teams

## 5.3 IBM Global Business Services

IBM Global Business Services® offers to implement their SAP solutions. for their customers. IBM employs over 10,000 SAP practitioners in 80 countries, with an average of nine years of hands-on SAP experience across the team. Our global SAP implementation capabilities offer a full breadth of services, including consulting, infrastructure and applications, in-depth support, and operational and management processes.

More information is available at the following web page:

http://www.ibm-sap.com/services

## 5.4 Insight from IBM: Optimal use of resources

Customers often look to IBM to help them resolve stressful issues. Customers that have large databases and a large IT infrastructure face multiple challenges. They often face system bottleneck issues, where the users complain of slow access to the database. There is also the ever-growing demand of hardware resources to meet the ever-growing database, while adding to or upgrading their existing installations, because the hardware resources are just not enough.

To add to this stress, there is a constant requirement to streamline all IT operations, increase the return on investment (ROI), reduce the operational cost, and optimize use of resources.

Insight is the IBM solution to such issues. It is a no-charge analytical tool that enables customers to reduce the total cost of ownership (TCO) of their SAP setup by helping them increase their optimization. Insight provides a professional analysis of the SAP environment at no charge and thus gives new perspectives of tactical and operational issues to the customer.

It helps identify deficiencies in the system and fine-tunes parameters to gain performance improvement. Insight ensures that critical bottlenecks and disruptions can be avoided with no major effort and investment. It helps improve response times and, as a result, acceptance by users. Insight is designed to increase return on hardware investment thus offering a higher ROI and reducing the risk of costly downtime.

#### Features of Insight

The Insight tool from IBM helps SAP customers identify deficiencies and challenges and resolve these issues.

- It is a no-cost tool to review a production SAP environment.
- Insight delivers a report detailing the existing workload and system use.
- This report can be used in the SAP upgrade sizing process.
- ► Insight is available for all IBM and non-IBM platforms.
- Supports all generally available SAP releases.
- Virtualized system use statistics
- Java stack components and their workload statistics (for example, PI, Portal, SAP Webs kernel.)
- Insight is a set of three Microsoft Windows programs:
  - Insight Collector captures SAP R/3 workload and OS utilization statistics
  - Insight Reducer gathers information, verifies and compresses data set
  - Insight Reporter generates the report (run by an IBM Techline specialist)

You can read more about Insight, download documents including a white paper, and download the software from the following web page:

http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS381

# 5.5 SAP NetWeaver Business Warehouse (BW) Accelerator and the IBM solution

SAP has a high number of Business Information Warehouse implementations in their installed base. The business analytics market is growing at a healthy pace as more organizations embrace fact-based decision making.

The two primary drivers of the demand for business analytics solutions are increasing data volumes and user populations. These drivers place new performance requirements on existing analytic platforms. To address these requirements, SAP has introduced SAP BW accelerator functionality with SAP NetWeaver, deployed as an integrated solution combining software and hardware to increase the performance characteristics of SAP NetWeaver BW deployments. Many of these clients have very large databases and face performance issues.

IBM Systems Solution for SAP NetWeaver BW Accelerator is a high performance analytical tool that is integrated within the SAP NetWeaver Business Warehouse component. The goal is to provide near-real-time analytics, and the ability to provide large numbers of users the access to data in a data warehouse in close to real time.

The solution, based on IBM blade servers and storage, can be implemented into any existing SAP BW environment and is flexible enough for IBM and non-IBM business intelligence environments.

The SAP BW Acclerator solution offers the following advantages:

- Bring BW to the majority and empower the business user.
- Crunch through terabytes of data in shorter time, enabling faster business insight, and super charge the customer business intelligence solution.
- Support a growing number of BW applications (such as composite applications) and a growing number of users with a stable, improved query response.
- Reduce administration costs.
- Scalable architecture that grows with increasing requirements over time.
- Achieve lower TCO for BW computing environment.
- Increase customer satisfaction on SAP BW investments with improved price and performance.

BW accelerator is installed on a pre-configured blade system. A blade system consists of hosts in the form of server blades. The server blades are connected to central disk storage. You can use BW accelerator only in connection with the SAP NetWeaver 2004s BW starting with SAP NetWeaver 2004s Support Package Stack 5.

SAP BusinessObjects Explorer, Accelerated Version, combines intuitive information search and exploration functionality with the high performance and scalability of in-memory analytics. SAP BusinessObjects Explorer is optionally available with IBM Systems Solution for SAP NetWeaver BW Accelerator.

With immediate insights into vast amounts of data from anywhere in the organization, your users can explore business at the speed of thought and improve their ability to make sound, timely decisions. More information about the IBM Systems Solution for SAP NetWeaver BW Accelerator, including information about SAP BusinessObjects Explorer, is available at the following web page:

http://www.ibm-sap.com/bwa

## 5.6 SAP Discovery System

The SAP Discovery system is a preconfigured hardware and software landscape that can be used to test drive SAP technologies. It is an evaluation tool that provides an opportunity to realize the joint value of the SAP business process platform and SAP BusinessObject tools running on a single system. It provides a complete, fully documented system with standard SAP software components for developing and delivering service-based applications, including all the interfaces, functionality, data, and guidance necessary to run a complete, end-to-end business scenario.

The IBM Systems Solution with SAP Discovery system uses the IBM System x3650 M3 server to provide a robust, compact and cost-effective hardware platform for evaluating SAP software in a virtual environment using VMware ESXi software with Microsoft Windows and

Novell SUSE Linux operating systems. By combining robust IBM hardware built on the Intel Xeon processor 5600 series, a wide range of preinstalled SAP software and a variety of demonstrations, examples, and hands-on exercises, the IBM Systems Solution with SAP Discovery system offers a fast, easy, and cost-effective way to explore, evaluate, and train on SAP products before deploying new software in your infrastructure.

More information about the IBM Systems solution with SAP Discovery system is available at the following web page:

http://www.ibm.com/sap/discoverysystem

## 5.7 MAX5

SAP systems are known to need a great deal of memory. Additionally, with SAP systems running in virtual environments it is not viable to overcommit memory (that is, have the total amount of the assigned memory of all virtual guests exceed the physical main memory of the server).

Figure 5-3 shows the x3850 X5 with the MAX5 attached.



Figure 5-3 x3850 X5 with the MAX5 memory expansion unit attached

The IBM MAX5 for System x (MAX5) memory expansion unit adds 32 DDR3 DIMM sockets to the x3850 X5 and x3690 X5. With a single-node x3850 X5, that means up to 1.5 TB of memory can be installed. It also adds an additional 16 channels of memory bandwidth, boosting overall throughput. This means that the MAX5 adds additional memory performance.

MAX5 enables you to perform the following tasks:

- ► Run more SAP systems in a virtual environment.
- ► Run larger SAP instances in a virtual machine.
- Deploy larger SAP databases (leveraging the additional memory)

- Run SAP databases faster by letting them use more memory for caching, which increases database performance.
- Reduce software license costs by expanding memory capacity with eX5 rather than purchasing more processors (scale memory independently from the processors)

In addition, the MAX5 memory expansion offers the following benefits:

- Memory scaling independently of processors, adding 32 DIMMs of extra memory capacity with maximum memory performance with16 extra memory channels for no compromises.
- Approximately 50% more virtual machines and leading database performance over competitor 4-socket systems (with the standard Intel design).
- Lower cost, high performance configurations reaching desired memory capacity using less expensive DIMMs

For more information about MAX5, see *IBM eX5 Portfolio Overview: IBM System x3850 X5, x3950 X5, and BladeCenter HX5*, REDP-4650 available from the following web page:

http://www.redbooks.ibm.com/abstracts/redp4650.html

## 5.8 IBM Systems Director

IBM Systems Director, an integral component of the IBM Smarter Systems portfolio, provides systems management personnel with a single-point-of-control, helping reduce IT management complexity and cost. It is a platform manager that enables the management of IBM System x physical servers and virtual servers running on this platform. IBM Systems Director Server provides a central control point for managing your IBM System x servers and managing all of the other IBM servers. You connect to IBM Systems Director Server through a web browser. IBM Systems Director Server can be installed on AIX, Windows, Linux on Power, Linux on x86, or Linux on System z.

IBM Systems Director provides the following functionality:

- Discovery
- Monitoring & Reporting
- Software Updates
- Configuration Management
- Virtual Resource Management
- Remote Control
- Automation

For additional details on implementing IBM Systems Director, refer to the IBM Redbooks, *Implementing IBM Systems Director 6.1*, SG24-7694 available from the following web page:

http://www.redbooks.ibm.com/abstracts/sg247694.html

The home page for IBM Systems Director is as follows:

http://www.ibm.com/systems/software/director/

## 5.9 Active Energy Manager

IBM Systems Director Active Energy Manager version measures, monitors, and manages the energy components of the IBM System x and BladeCenter systems. Monitoring functions include power trending, thermal trending, PDU support, and support facility providers. Management functions include power capping and power savings mode.

This solution helps customers monitor energy consumption to allow better use of available energy resources. The application software enables customers to trend actual energy consumption and corresponding thermal loading of IBM Systems running in their environment with their applications. This helps customers achieve the following benefits:

- Allocate less power and cooling infrastructure to IBM servers
- Lower power usage on select IBM servers
- Plan for the future by viewing trends of power usage over time
- Determine power usage for all components of a rack
- Retrieve temperature and power information through wireless sensors
- ► Collect alerts and events from facility providers related to power and cooling equipment

Better understand energy usage across your data center with the following benefits.

- Identify energy usage
- Measure cooling costs accurately
- Monitor IT costs across components
- Manage by department or user

Refer to the following web page for additional information about Active Energy Manager:

http://www.ibm.com/systems/software/director/aem/

For more information, refer to the IBM Redbooks publication *Implementing IBM Systems Director Active Energy Manager 4.1.1*, SG24-7780 available from the following web page:

http://www.redbooks.ibm.com/abstracts/sg247780.html

## 5.10 SAP with Tivoli integration

Companies are looking to maximize their investments, especially when we are talking about SAP. IBM Service Management solutions from Tivoli are designed to improve IT process innovation and integration.

The success of your SAP solutions relies not only on the SAP application itself, but also on the larger infrastructure on which the SAP solution runs. In fact, the interrelationships between various application and infrastructure elements that are important for SAP success can include many unknown dependencies. To get a competitive advantage, organizations have to integrate the comprehensive application management tools that provide application-specific management information (such as monitoring, discovery, and security data). This relatively SAP-specific management information can then be used effectively to manage the entire SAP ecosystem.

The solution is addressing key SAP and IT challenges through the Service Management portfolio from process management (like Incident/Problem or Change/Configuration) to operational management, such as monitoring, security, IT assets, storage, and change/configuration management.

IBM Tivoli provides a complete integration suite to integrate and administer SAP environments:

- Integrated incident and problem management in SAP environments
- Monitoring the SAP landscape and monitor SAP Transactions Response time
- Correlate event information and visualize SAP environments in business terms
- Manage customers service levels and report to business objectives

- Automated discovery of SAP landscapes and their dependencies with non-SAP components
- Integrated SAP change and configuration management with Tivoli CCMDB
- ► Integrated scheduling of SAP jobs with Tivoli Workload Scheduler
- Advanced storage management with Tivoli Storage Management Solutions including Flash Copy Manager
- High availability and automation solutions with Tivoli System Automation, Automate SAP Data Center Processes
- Integrated SAP security management across all SAP security needs with the IBM Security Solution, including identity, compliance and access management
- Dynamic provisioning of SAP landscapes

Tivoli provides value with integrated SAP Management:

- One single service management solution to integrate SAP operations management, SAP service management and SAP life cycle management
- Unified setup of policy and procedure across SAP landscapes from a single portal interface, including integration of existing SAP tools
- Better staff productivity and minimization of revenue impact through faster problem resolution
- Proactively resolve problems before they impact business
- Application availability is improved by reducing the number and duration of incidents that impact availability
- ► Unified system to ensure all SAP resources are highly available.
- Provide a integrated functionality to manage/monitor the performance of critical business processes and applications, perform diagnostics, troubleshoot poor performance, and other administrative tasks
- ► Breadth of management across the entire SAP/service infrastructure
- Scalability to support fast-growing IT/SAP infrastructures
- Service context to understand how to configure, optimize and prevent disruption
- ► SAP integration and accessibility of technology, processes and information
- Obtain greater insight into SAP performance by monitoring key business metrics
- ► Use leading best practices for the strategy, design and implementation of SAP solutions

Detailed information about the Tivoli SAP Service Management Solution is available on the IBM SAP Alliance web site or at the IBM Tivoli availability center for SAP:

http://www.ibm.com/solutions/sap/us/en/solution/T374829096939004.html

## 5.11 Summary

To summarize, an IBM System x and BladeCenter offering is the ideal platform for customers to implement mission-critical applications (such as SAP), that are looking for reliability, manageability, and scalability with the flexibility to run Windows or Linux. The eX5-Architecture family is the foundation of a cost-effective SAP solution landscape. This new family of products provides a low cost, scalable platform with superior performance and

unmatched reliability. The IBM System x and BladeCenter family is perfectly suited for SAP solutions because it offers the following unmatched advantages:

Scalability

IBM eX5 offers unparalleled scalability from 2-way to 8-way servers, and the ability to scale memory independently from the processors. No competitor can provide such flexible scalability on an Intel x64 architecture.

Performance

IBM System x and BladeCenter servers have delivered industry-leading performance benchmarks on SAP and other platforms, a clear lead over their competitive products. IBM eX5 servers are purpose-built for SAP high-end workloads. They offer an increase in the total available memory for SAP solutions with high memory demands (such as SAP databases and virtualization scenarios), the option highly reliable memory mirroring without capacity trade-offs, and they deliver greater memory capacity and bandwidth for enhanced performance. IBM eXFlash, with up to 32 hot swappable solid state disks per system in combination with a high-speed controller architecture, deliver extreme performance to replace limited IOPS capability of traditional hard drives.

Reliability

It is imperative for a critical server environment to have built-in redundancy on a maximum number of components to ensure that the servers are always available to the users with no downtime. With unique features (such as light path diagnostics, active memory, and so forth) System x and BladeCenter are the best platforms to meet this requirement for high-end solutions (such as SAP).

Cost-effective deployment

Because the IBM System x servers offer extremely high scalability and high performance, the overall hardware sizing requirement is reduced for any application. Moreover, the simplification of deployment and maintenance allows SAP customers to focus on their implementation and better manage their infrastructure costs.

Virtualization and provisioning

Virtualization technologies in conjunction with the right provisioning tools can help customers manage compute resources in a more efficient manner. This helps increase overall use of assets, while providing additional capacity on demand. It improves collaboration across spheres of any organization, helping them to focus on growing their business. The IBM eX5 servers help reduce license cost for virtualization by providing you with an unmatched amount of memory per socket.

Manageability

IBM helps customers improve their IT infrastructure management by reducing the complexity of IT. Through autonomic computing technologies, IBM helps customers better use their critical skills, allowing IT to do more with less. This helps position them to respond dynamically to unpredictable workloads and better manage the proliferation of systems.

## **Abbreviations and acronyms**

ABAP	Advanced Business Application		Hypertext Transfer Protocol
ACT		HW	Hardware
	Advanced Micro Devices	I/O	Input/output
	application programming interface	ICC	International Competency Center
		ICM	Internet Communication Manager
ASCS	ABAP central services instance	IGMP	Internet Group Management Protocol
ΑΤΑ	AT attachment	IGS	Internet Graphics Service
BGP	Border Gateway Protocol	IP	Internet Protocol
BI	Business Intelligence	IPMI	Intelligent Platform Management
BIOS	Basic input output system		Interface
ВМС	Baseboard management controller	ISICC	IBM SAP International Competence
CCMS	Computer Center Management System	ISV	Center Independent Software Vendor
CCNA	Cisco Certified Network Associate	ΙТ	Information technology
CD-ROM	Compact disc read only memory	ITSO	International Technical Support Organization
CIFS	Common Internet File System	IVN	Industry value network
CPU	Central processing unit	IXA	Integrated xSeries Adapter
CRM	Customer Relationship Management	кум	Keyboard video mouse
CTSC	Collaboration Technology Support	LAN	Local area network
0100	Centers	LED	Light emitting diode
DB	Database	LTO	Linear Tape-Open
DDR	Double Data Rate	MCDBA	Microsoft Certified Database
DIMM	Dual inline memory module		Administrator
DRAM	Dynamic random access memory	MCSA	Microsoft Certified Systems
ECC	Error checking and correcting	MCSE	Microsoft Cartified Systems
eDRAM	Embedded DRAM	WOOL	Engineer
ERP	Enterprise Resource Planning	MP	Multiprocessor
ESCON®	Enterprise systems connection	MSCS	Microsoft Cluster Server
FC	Fibre Channel	MSIM	Multi-Switch Interconnect Module
FICON®	Fibre Connection	NAS	Network addressable storage
FSB	Front-side bus	NEBS	Network equipment building system
GB	Gigabyte	NFS	Network file system
GRC	Governance, Risk and Compliance	NOS	Network operating system
HA	High availability	OEM	Other equipment manufacturer
HBA	Host Bus Adapter	OS	Operating system
HCL	Hardware Compatibility List	OSPF	Open Shortest Path First
HDD	Hard disk drive	PCI	Peripheral Component
HPC	High performance computing		Interconnect
нт	Hyper-Threading	PDF	Portable Document Format

PDU	Power distribution unit	URL	Uniform Resource Locator
PFA	Predictive Failure Analysis	USB	Universal serial bus
PLM	Product life cycle management	VRRP	Virtual router redundancy protocol
POST	Power on self test	WfMC	Workflow Management Coalition
QA	Quality Assurance	WW	World wide
RADIUS	Remote Authentication Dial In User Service		
RAID	Redundant array of independent disks		
RAM	Random access memory		
RDM	Remote Deployment Manager		
RFID	Radio frequency identification		
RIP	Routing Information Protocol		
ROI	Return on Investment		
RPM	Red Hat Package Manager		
RSA	Remote Supervisor Adapter		
SA	Solution assurance		
SAN	Storage Area Network		
SAPS	SAP Application Benchmark Performance Standard		
SAS	Serial Attached SCSI		
SATA	Serial ATA		
SCM	Supply Chain Management		
SCSI	Small computer system interface		
SD	Sales and distribution		
SDM	Software Deployment Manager		
SDN	SAP Developer Network		
SFF	Small form factor		
SFP	Small form-factor pluggable		
SIMD	Single instruction multiple data		
SIO	Storage and I/O		
SL	SlimLine		
SOA	Service-oriented Architecture		
SQL	Structured query language		
STP	SATA Tunneled Protocol		
SVC	SAN Volume Controller		
TACACS	Terminal Access Controller Access Control System		
ТВ	Terabyte		
тсо	Total Cost of Ownership		
TCP/IP	Transmission Control Protocol/Internet Protocol		
TPC	Transaction Processing Council		
TSA	Tivoli System Automation		
TSM	Tivoli Storage Manager		

## **Related publications**

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this Redpaper.

## **IBM Redbooks**

For information about ordering these publications, see "How to get IBM Redbooks" on page 87. Note that the documents referenced here might be available in softcopy only.

- Cisco Systems Intelligent Gigabit Ethernet Switch Module for the IBM eServer BladeCenter, REDP-3869
- ► IBM BladeCenter 4Gb SAN Solution, SG24-7313
- IBM BladeCenter HS22V Technical Introduction, REDP-4647
- IBM BladeCenter iSCSI SAN Solution, REDP-4153
- ► IBM BladeCenter Networking with the 4-Port Gigabit Ethernet Switch Module, REDP-3660
- IBM eServer BladeCenter Layer 2-7 Network Switching, REDP-3755
- IBM eServer xSeries and BladeCenter Server Management, SG24-6495
- ► IBM eX5 Portfolio Overview: IBM System x3850 X5, x3950 X5, and BladeCenter HX5, REDP-4650
- ► IBM System Storage Solutions Handbook, SG24-5250
- ► IBM Tivoli Storage Manager in a Clustered Environment, SG24-6679
- Implementing an IBM/Brocade SAN with 8 Gbps Directors and Switches, SG24-6116
- Implementing Cisco InfiniBand on IBM BladeCenter, REDP-3949
- Implementing IBM Systems Director 6.1, SG24-7694
- Implementing IBM Systems Director Active Energy Manager 4.1.1, SG24-7780
- Implementing the IBM System Storage SAN Volume Controller V5.1, SG24-6423
- Integrating IBM Director with Enterprise Management Solutions, SG24-5388
- Introduction to Storage Area Networks, SG24-5470
- Nortel Networks L2/3 Ethernet Switch Module for IBM eServer BladeCenter, REDP-3586
- Planning and Installing the IBM eServer X3 Architecture Servers, SG24-6797
- ► SAP Applications on IBM PowerVM, SG24-7564
- ► The IBM eServer BladeCenter JS20, SG24-6342

## **Online resources**

These web sites are also relevant as further information sources:

#### **IBM pages**

- IBM System x and BladeCenter with SAP applications http://www.ibm.com/systems/x/solutions/infrastructure/erpcrm/sap.html
- IBM Hardware Sizing Questionnaires http://www.ibm.com/erp/sizing
- Benchmarks: IBM System x http://www.ibm.com/servers/eserver/xseries/benchmarks
- IBM System Storage Proven http://www.storage.ibm.com/proven
- SAP with Veritas Storage Foundation HA on IBM System x and IBM BladeCenter http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100970
- Tivoli Storage Manager for Enterprise Resource Planning http://www.ibm.com/software/tivoli/products/storage-mgr-erp/
- Tivoli Storage Manager for Advanced Copy Services http://www.ibm.com/software/tivoli/products/storage-mgr-advanced-copy-services/
- IBM Tivoli System Automation for Multiplatforms http://www.ibm.com/software/tivoli/products/sys-auto-multi/
- IBM Insight for SAP ERP Utility for anyone running SAP http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS381
- ► IBM PowerExecutive

http://www.ibm.com/systems/management/director/extensions/powerexec.html

IBM Global Business Services and SAP http://www.ibm.com/solutions/sap/doc/content/landingdtw/1882654130.html

## **SAP** pages

SAP on Linux

http://www.sap.com/linux/

► SAP on Microsoft Windows

https://www.sdn.sap.com/irj/sdn/windows

 SAP Standard Application Benchmarks http://www.sap.com/benchmark

#### **Others pages**

- Transaction Processing Performance Council http://www.tpc.org
- SAP Certification: IBM systems http://saponwin.com/pub/hardware.asp?l=vendor&sl=12&la=en

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# The Benefits of Running SAP Solutions on IBM eX5 Systems



# Information and processes to help you size an IBM solution

Considerations for hardware and software selection

Offerings from IBM for systems and storage SAP is the maker of one of the world's most popular inter-enterprise software suites. It provides collaborative business solutions for all types of industries. The company's flagship offering is the SAP Business Suite, which includes solutions for enterprise resource planning (ERP), customer relationship management (CRM), product life cycle management (PLM), and supply chain management (SCM).

This IBM Redpaper describes the benefits of running SAP on the IBM System x and IBM BladeCenter platforms, including the IBM eX5 flagship systems, the x3850 X5 and BladeCenter HX5. We first introduce the SAP offerings, then we explain the processes involved in correctly sizing an SAP platform and the tools and resources available to make the best decisions. We also review the hardware offerings from IBM both for systems and for storage and networking. We also describe suitable hardware solutions. Finally, we discuss the advantages of using IBM high-performance platforms for running SAP solutions.

This paper is for SAP administrators and technical solution architects. It is also for business partners and IBM employees that want to know more about SAP offerings and available IBM solutions for SAP customers.

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