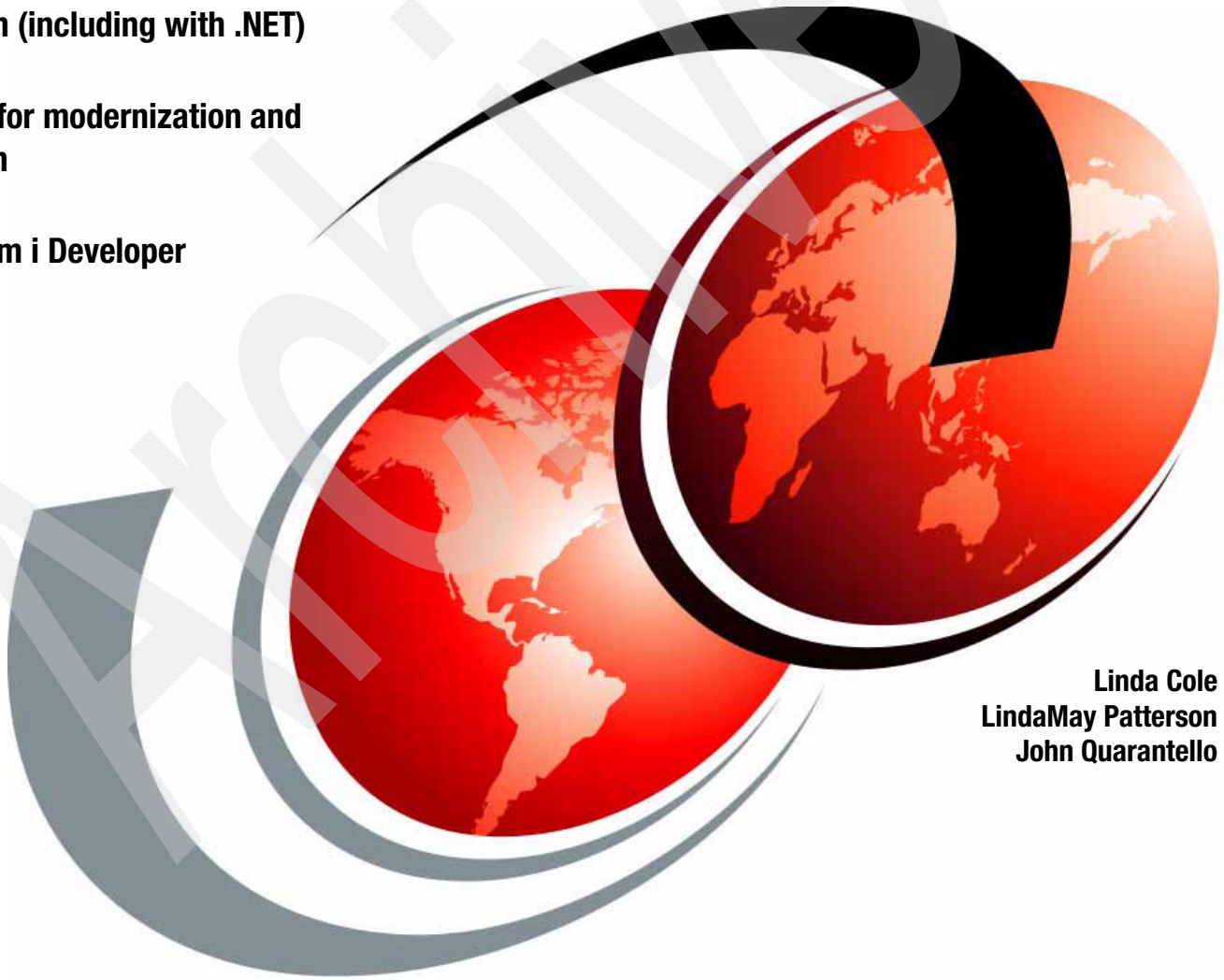
IBM

IBM System i Tools Innovation Program:

Resource Guide for Modernization and Integration Tools for System i Applications

- ISV tools for modernization and integration (including with .NET)
- IBM tools for modernization and integration
- IBM System i Developer Roadmap



Linda Cole
LindaMay Patterson
John Quarantello

ibm.com/redbooks

Redpaper

International Technical Support Organization

IBM System i Tools Innovation Program: Resource Guide for Modernization and Integration Tools for System i Applications

April 2006

Note: Before using this information and the product it supports, read the information in “Notices” on page vii.

First Edition (April 2006)

This edition applies i5/OS Version 5, Release 4 (product number 5722-SS1).

Contents

Notices vii
Trademarks viii
Legal Disclaimer viii

Preface xi
The team that wrote this Redpaper xii
Become a published author xiii
Comments welcome xiii

Chapter 1. Introducing the IBM System i and i5/OS V5R4 1
1.1 Introducing System i 2
1.2 System i value proposition 2
1.3 System i5 models 4
1.4 i5/OS V5R4 value proposition 6
1.4.1 Promoting solutions innovation 6
1.4.2 Integrating with other systems and operating environments 8
1.4.3 Promoting business resilience and compliance 8
1.4.4 Enabling ISVs 9

Chapter 2. Introducing IBM System i Initiative for Innovation 11
2.1 Introducing the System i Initiative for Innovation 12
2.2 System i Initiative for Innovation program 13
2.2.1 Application Innovation program 14
2.2.2 Tools Innovation program 15
2.2.3 System i Initiative for Innovation program 15
2.3 Introducing the System i Developer Roadmap 16
2.3.1 System i Developer Roadmap with subcategories 18

Chapter 3. IBM ServerProven tools for application modernization and integration 19
3.1 IBM ServerProven ISV tools 20
3.2 System i Tools Innovation program 20
3.3 Tools to improve your productivity 21
3.3.1 Code analysis, documentation, and tracking tools 22
3.3.2 Integrated development environments 24
3.4 Tools to enhance the end-user experience 32
3.4.1 Application refacing 32
3.4.2 Portal and personalization 36
3.5 Tools to create a modular architecture 37
3.5.1 Business rule logic extraction for SOA 38
3.5.2 Client integration 38
3.5.3 .NET integration 42
3.5.4 Regenerate RPG into J2EE 42
3.5.5 RPG to Java conversion 43
3.5.6 SOA framework tools 44
3.6 Tools to integrate applications 44
3.6.1 Connectivity 45
3.6.2 Data movement and migration 48
3.6.3 EAI/Application integration 49
3.7 Tools to integrate business processes 52

3.7.1 Business integration 52

Chapter 4. IBM tools for application modernization and integration 55
4.1 IBM tools in the System i Tools Innovation Program 56
4.2 Tools to improve your productivity 56
4.2.1 Integrated development environments 57
4.3 Tools to enhance the end-user experience 59
4.3.1 Application refacing 59
4.3.2 Application servers 62
4.3.3 Portal and personalization 63
4.4 Tools to create a modular architecture 65
4.4.1 Client integration 66
4.4.2 .NET integration 67
4.4.3 SOA framework tools 67
4.5 Tools to integrate applications 67
4.5.1 Connectivity 68
4.5.2 Data movement and migration 68
4.5.3 EAI/Application integration 70
4.6 Tools to integrate business processes 71
4.6.1 Business integration 72

Chapter 5. Integrating System i with Microsoft .NET 75
5.1 System i and .NET integration 76
5.2 High level overview of .NET 76
5.2.1 Architecture 76
5.3 .NET integration 77
5.3.1 IBM ServerProven ISV tools for integration 77
5.3.2 IBM tools for integration 80
5.3.3 Applications using ADO.NET 82

Chapter 6. Leveraging System i and xSeries integration to deploy Windows 2003 applications 83
6.1 System i5 integrated xSeries solutions 84
6.2 Key advantages to System i and xSeries integration 84
6.3 Introducing the Integrated xSeries Server 85
6.4 Introducing the Integrated xSeries Adapter 86
6.5 Introducing System i, xSeries, and BladeCenter integration via iSCSI 86
6.6 IBM System i5, xSeries, and BladeCenter integration advantages 87

Chapter 7. System i integration using SOA and Web services 89
7.1 Why tap into SOA and Web services? 90
7.2 Introducing SOA 90
7.2.1 Benefits of SOA 91
7.3 Introducing Web Services 92
7.3.1 Web Services Interoperability Organization 95
7.4 Tools and products for SOA and Web services 95
7.4.1 IBM tools for creating Web services and promoting SOA 95
7.4.2 IBM Application servers 97
7.4.3 IBM ServerProven ISV tools for Web Services and SOA 98

Related publications 105
IBM Redbooks 105
Other publications 106
Online resources 106

How to get IBM Redbooks 107
Help from IBM 107

Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:
IBM Director of Licensing, IBM Corporation, North Castle Drive Armonk, NY 10504-1785 U.S.A.

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:
This information contains sample application programs in source language, which illustrates programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. You may copy, modify, and distribute these sample programs in any form without payment to IBM for the purposes of developing, using, marketing, or distributing application programs conforming to IBM's application programming interfaces.

Trademarks

The following terms are trademarks of the International Business Machines Corporation in the United States, other countries, or both:

AnyNet®
AIX 5L™
AIX®
AS/400®
BladeCenter®
Catapult®
CICS®
DataPropagator™
Domino Designer®
Domino®
DB2 Connect™
DB2 Universal Database™
DB2®
@server®
@server®
eServer™
Everyplace®
i5/OS®
Informix®
IBM®
IMS™
iSeries™
Lotus Enterprise Integrator®
Lotus Notes®
Lotus®
NetServer™
Notes®
OfficeVision/400™
OmniFind™
OS/400®
POWER™
POWER5™
POWER5+™
pSeries®
Rational®
Redbooks™
Redbooks (logo) ™
S/390®
ServerProven®
System i™
System i5™
TotalStorage Proven™
TotalStorage®
WebSphere®
Workplace™
Workplace Web Content Management™
X-Architecture™
xSeries®
z/OS®
zSeries®

The following terms are trademarks of other companies:

EJB, Java, JavaServer, JavaServer Pages, JDBC, JMX, JSP, JVM, J2EE, Solaris, and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

ActiveX, Excel, Microsoft, Outlook, Visio, Visual Basic, Visual Studio, Windows server, Windows, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Intel, Pentium, Intel logo, Intel Inside logo, and Intel Centrino logo are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

Legal Disclaimer

Solution Connection has been developed as reference for IBM and third party application solutions. The ISV tool descriptions provided in this Redpaper are taken from the Solution Connection Web site at:

https://www.ibm.com/servers/solutions/finder/portal/search.jsp

The material presented for ISV Solution Connection is based on information obtained from the software provider. No effort has been made to independently verify the accuracy of the information, including any information relating to the functions (including year 2000 compliance), quality, and performance of the provider's products or services as well as the availability date. Applications bearing the ServerProven logo are licensed to use that logo based upon the software provider's submission of information concerning one or more end-user customers that have successfully implemented its product on the indicated IBM hardware platform. This information is confirmed by IBM with the end-user customer or customers indicated by the software provider in its submission to IBM. IBM does not warrant, however, that these end-user customer experiences are typical of those encountered by the software provider's customer, nor that any installation will be free of errors. Potential customers accessing this site are responsible for determining whether any particular software provider's products or services are suitable for their own needs. Prices, specific hardware or software requirements and availability dates may be obtained by contacting the software provider. (In addition, the support provided may vary from one software provider to another.) Individual software providers should be contacted regarding such items as installation, support, education, documentation, maintenance and any other terms and conditions.

Any material presented in this Redpaper that has been taken from the ISV tool descriptions found on the Solution Connection Web site at:

https://www.ibm.com/servers/solutions/finder/portal/search.jsp

does not constitute an expressed or implied recommendation or endorsement by the industry or IBM of any particular product, service, company, or technology, but is intended simply as an information guide that will give a better understanding of the options available to you.

IBM does not assist potential customers in any way in the selection, review or acquisition of any non-IBM products, including those listed in this System. IBM takes no responsibility whatsoever with regard to the selection, performance, or use of the products listed on the Solution Connection Web site, including, but not limited to, products licensed to use the ServerProven logo.

All understandings, agreements, or warranties concerning any product must take place directly between the software provider and the customer.

IBM MAKES NO WARRANTIES OF ANY KIND WITH RESPECT TO THE CONTENTS OF THE ISV SOLUTION CONNECTION, THE PRODUCTS LISTED THEREIN, OR THE COMPLETENESS OR ACCURACY OF THE ISV SOLUTION CONNECTION. IBM SPECIFICALLY DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

We acknowledge that certain trademarks may be owned by other companies.

Preface

The IBM® System i™ Tools Innovation program is part of the IBM System i Initiative for Innovation program introduced in early 2005. There are over 125 independent software vendors (ISVs) that are members of this program. These ISVs have tools available to help other ISVs and clients with some aspect of enhancing, modernizing, and integrating existing System i applications.

This IBM Redpaper focuses on a subset of the ISVs that have tools to help modernize or integrate System i applications. The ISV tools identified in this paper have been certified as IBM ServerProven®, meaning they are available today and they have been successfully installed at client accounts. The System i Developer Roadmap, associated with the System i Tools Innovation program, identifies the modernization steps and relies on tools from IBM and ISVs that focus on System i application modernization and integration. The ISVs referenced in this Redpaper are all members of the System i Tools Innovation program.

The System i Developer Roadmap has five high level steps:

- Improve your productivity
- Enhance the end-user experience
- Create a modular architecture
- Integrate applications
- Integrate business processes

This Redpaper is an ideal resource guide that provides a brief description of the IBM and ISV tools associated with the selected steps and subcategories in the roadmap. The paper aids System i developers searching for and evaluating the IBM and ISV tools available. Links are provided to the appropriate IBM tool and ISV tool Web sites.

Each of the chapters provides insights:

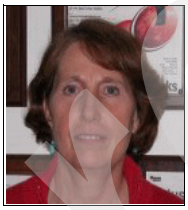
- Chapter 1, “Introducing the IBM System i and i5/OS V5R4” on page 1: This chapter provides an overview of the new System i platform and the latest version of i5/OS (V5R4). The System i value proposition helps you understand not only the value the platform provides but gives you insight into how you can take advantage of the platform to help satisfy your business needs.
- Chapter 2, “Introducing IBM System i Initiative for Innovation” on page 11: This chapter discusses the System i Initiative for Innovation and the three programs that make it up. The chapter shows the objectives of each program. The System i Developer Roadmap is also discussed, which provides key steps in application modernization and integration.
- Chapter 3, “IBM ServerProven tools for application modernization and integration” on page 19: This chapter identifies the ISV tools (within the System i Tools Innovation program) associated with the specific steps and subcategories in the System i Developer Roadmap. These specific roadmap steps and subcategories are explored and the associated ISV tools are identified.
- Chapter 4, “IBM tools for application modernization and integration” on page 55: This chapter takes the same approach as Chapter 3, “IBM ServerProven tools for application modernization and integration” on page 19, but this time identifies the IBM tools (associated with the System i Tools Innovation program) that provide the capabilities necessary to modernize and integrate System i applications.

- Chapter 5, “Integrating System i with Microsoft .NET” on page 75: This chapter gives a high level description of .NET and identifies the IBM and ISV tools (within the System i Tools Innovation program) that enable the integration of .NET and System i applications.
- Chapter 6, “Leveraging System i and xSeries integration to deploy Windows 2003 applications” on page 83: This chapter introduces the Integrated xSeries Server, xSeries system integration with System i via the Integrated xSeries Adapter and xSeries and BladeCenter® integration via the new System i5™ Internet Small Computer System Interface (iSCSI) Host Bus Adapters.
- Chapter 7, “System i integration using SOA and Web services” on page 89: This chapter gives a brief overview of service-oriented architecture (SOA) and Web services. The chapter then identifies the IBM and ISV tools (within the System i Tools Innovation program) available to help develop or extend applications using SOA and Web services.

The team that wrote this Redpaper

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

Linda Cole is a Certified Consulting iSeries™ Specialist. Her current assignment, with the IBM Toronto Lab, is the System i Tools Innovation Manager. She is working with over 100 IBM Business Partners in the IBM System i Tools Innovation program. She has over 25 years with IBM in a variety of assignments, including technical support, education, consulting, sales and marketing. She has an extensive background in System i dating back to 1988. She specializes in WebSphere® offerings, Application Development, and Business Intelligence. She is a frequent speaker at COMMON, users groups, and technical conferences.



Lindamay Patterson is an Advisory Software Engineer in the International Technical Support Organization, Rochester Center. She leads teams that produce System i and IBM software related presentations, Web content, and Redbooks. Before joining the ITSO, she worked on various Redbooks on Pervasive (Mobile) Computing and has had numerous articles published.

John Quarantello is the IBM System I Tools Executive managing the System i Tools Innovation program. He works out of Keller, TX (USA) and has 31 years of experience working in sales, marketing, and management positions. His entire career has been focused on the S/3X, AS/400®, iSeries and System i platform. John holds an Economics degree from Ithaca College. He has experience in working with the System i platform leveraging Domino®, Java™, WebSphere, and ISV solutions.

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

David Bruce
IBM Systems & Technology Group, iSeries

Lori DuBois
IBM Systems & Technology Group, Development

George Gaylord
IBM Systems & Technology Group, iSeries

Elena Lowery
IBM Systems & Technology Group, Operations

Carole Miner
IBM Systems & Technology Group, Development

Become a published author

Join us for a two- to six-week residency program! Help write an IBM Redbook dealing with specific products or solutions, while getting hands-on experience with leading-edge technologies. You'll team with IBM technical professionals, Business Partners, and clients.

Your efforts will help increase product acceptance and client satisfaction. As a bonus, you'll develop a network of contacts in IBM development labs, and increase your productivity and marketability.

Find out more about the residency program, browse the residency index, and apply online at:

ibm.com/redbooks/residencies.html

Comments welcome

Your comments are important to us!

We want our papers to be as helpful as possible. Send us your comments about this Redpaper or other Redbooks™ in one of the following ways:

- Use the online **Contact us** review redbook form found at:

  ibm.com/redbooks

- Send your comments in an e-mail to:

  redbook@us.ibm.com

- Mail your comments to:

  IBM Corporation, International Technical Support Organization
  Dept. JLU Building 107-2
  3605 Highway 52N
  Rochester, Minnesota 55901-7829

1

Introducing the IBM System i and i5/OS V5R4

This chapter provides an overview of the System i and the i5/OS V5R4 operating system. This chapter contains the following:

- Introduces the System i and identifies its value proposition
- Explores the new System i5 models
- Discusses i5/OS V5R4 and its value proposition

1.1 Introducing System i

The IBM System i products, the most complete and secure integrated business system, are designed to run thousands of the world's most popular business applications, which gives you the opportunity to select the solution that best fits your business needs. System i solutions provide faster, more reliable, and highly secure ways to help you simplify your IT environment and reduce expenses.

IT environments, in many companies, are increasingly complex because of the growing number of Wintel and UNIX® servers needed to support their business applications. Executives are searching for ways to reduce the complexity of their IT environments and reduce the costs associated them. IT simplification is a priority item for many executives. Simplifying IT can be accomplished by:

- Reducing the number of servers needed to run the business applications, thereby simplifying the physical make up of the IT environment.
- Reducing the number of people required to manage those servers, freeing up these critical resources for performing other important and strategic activities.
- Reducing the cost to maintain the servers and the overall IT environment, making capital available for other business needs or allowing you to apply that capitol to innovation within the business.

The System i platform is the only system in the world running the most popular operating systems on a single system, simultaneously. This capability enables it to run thousands of the world's most popular business applications, giving your company a vast number of applications to select from without being inhibited by the operating environment the software requires.

In addition, the System i integrated design combines the operating systems, middleware, database, security and storage into one system. This integrated design eliminates the seams between all of the software layers and allows you to have one standard base for all hardware and middleware.

A System i deploys quickly, is less costly to maintain, and is easy to manage. System i solutions also provide the highest availability and reliability of any midrange system. Both of these characteristics reduce system management and system maintenance costs.

The System i architecture is very secure and virus-resistant by design. The System i can help businesses save money by avoiding multiple security patches throughout the year as well as reducing your company's concern over comprised company data.

The System i platform helps manage unpredictable growth, enabling your business to respond quickly to unexpected client and market demands or new transaction volumes.

1.2 System i value proposition

The System i, announced January 31, 2006, offers a strong value to clients. The System i platform executes new and innovative applications while retaining the ability to execute core applications currently running on i5/0S. The three key aspects of System i value proposition are its ability to:

- Promote solutions innovation
- Simplify your IT
- Promote partnership

The System i family promotes solutions innovation with an application portfolio of 20,000 solutions offered by more than 4,500 independent software vendors (ISVs). It is the industry's most integrated system, making it easy for businesses to add infrastructure and collaborative solutions (such as IBM Workplace™ and Lotus® Domino) to their core business processing. The System i provides you the unrivaled flexibility to choose solutions that match business requirements regardless of the operating system required by the software.

Simplifying your IT environment is an important step toward cutting administrative costs and increasing the availability of your IT personnel, caught up in day-to-day activities. Many businesses have become slaves to their server farms and are forced to manage an ever-increasingly complex IT environment. The System i simplifies your IT infrastructure because it is an integrated, easy-to-manage system that delivers outstanding return on investment (ROI).

The System i promotes partnership by building on existing POWER5™ skills and simplifying deployment of new POWER5+™ systems. These new POWER5+ systems support both V5R3 and V5R4, allowing clients to purchase new systems and retain the ability to run existing applications. This also enables clients to continue to innovate and modernize their applications without the fear of exceeding the capacity of the new system.

Figure 1 provides important details on the new System i5 models.

IBM System i5

	520	550	570	595
Processor **Max CPW**	1, **1/2-way** 1.9 POWER5+ 7100	1/4-way 1.9 POWER5+ 14,000	**2/16-way** 2.2 POWER5+ 58,500	8/64-way 1.9 POWER5 184,000
Key Changes	**Accelerator Capacity on Demand** DDR2 Memory Optional IOP/HSL	DDR2 Memory Optional IOP	**Simpler Structure & Licensing** DDR2 Memory Optional IOP	Expanded I/O Optional IOP
i5/OS Release	V5R3 & V5R4	V5R3 & V5R4	V5R3 & V5R4	V5R3 & V5R4

		EDITIONS		
Value / Express	Y			
Standard	Y	Y	Y	Y
Enterprise	Y	Y	Y	Y
Solution	Y	Y		
Domino (Workplace)		Y		
High Availability	Y	**Y**	Y	**Y**
Capacity Backup Upgrade			Y	**Y**

Figure 1-1 IBM System i5 models

IBM has put the latest POWER5+ processors in the System i5 models 520, 550, and 570, and the faster POWER5 process in the model 595. With these processors and the i5/OS V5R4, IBM has delivered the only system that can simultaneously run the most popular operating systems including Microsoft Windows, Linux® on POWER™, Linux on Intel®, AIX® 5L™ and i5/OS (V5R3 and V5R4).

Historically, the "*i*" in System i and the IBM @server® iSeries has stood for integrated. This is because all the components necessary to support robust business solutions such as DB2® Universal Database™ (UDB), security, systems management, middleware, online transaction processing (OLTP), and more are integrated and tested with the hardware. The new System i announcements can claim *innovation* as well as integration as a term that characterizes the System i.

1.3 System i5 models

The IBM System i5 models consists of the 520, 550, 570, and 595 offerings.

The System i5 520 is designed for small to medium-sized businesses and offers:

- The System i5 520 Value and Express are ideal for small companies expanding their systems to add Web-enabled or groupware solutions. Companies can boost their capacity for new applications with the IBM Accelerator for System i5. Companies can select from the fully configurable System i5 520 Value Edition or seven predefined Express configurations. Characteristics includes:
  - 1 way POWER5+ 1.9 GHz
  - Optional input output (IO) processor
  - Up to 32 GB memory
  - Up to 19 TB disk
  - Up to 10 logical partitions (LPARs)
  - i5/OS V5R3 and V5R4
- The System i5 520 Standard Edition provides mid-size companies a system to run multiple e-business solutions. With this system, they can run Java and WebSphere programs along side groupware applications. This system delivers rapid expansion with Capacity on Demand. Characteristics includes:
  - 1/2 way POWER5+ 1.9 GHz
  - Optional IO processor and High Speed Link (HSL)
  - Up to 32 GB DDR2 memory
  - Up to 19 TB disk
  - Up to 20 LPARs
  - i5/OS V5R3 and V5R4
- The System i5 520 Enterprise Edition delivers growth and upgrade options for mid-sized companies running core business applications. It also delivers rapid expansion with Capacity on Demand and provides the base for the High Availability Edition and selected Solution Editions. Characteristics includes:
  - Optional IO processors and HSL
  - Up to 32 GB DDR2 memory
  - Up to 19 TB disk
  - Up to 20 LPARs
  - i5/OS V5R3 and V5R4

IBM Accelerator for System i5 (now available on the i520) offers the ability to dynamically add processing capacity for running additional applications. The Accelerator, in essence, enables you to upgrade the processing capacity at the point of need. This is accomplished by paying

an activation fee to upgrade your processing capability, while you keep the same system and the same software licensing cost. The Accelerator boosts performance, enabling small companies to run Web-enabled and groupware solutions on the same system as their core business applications.

Capacity on Demand (CoD) supports a broad range of core business applications, enabling clients to consolidate or add new applications to extend their system capabilities. CoD, now available on the IBM System i5 520 2-way model, allows businesses to obtain either temporary or permanent increases in processor capacity, memory, and storage device utilization. This allows business to feel secure with systems that can react quickly to unpredictable market opportunities, client needs and external pressures without missing a beat or interrupting existing processes.

The System i5 550 is designed for the unique IT environment requirements of medium- to large-sized business. This system is ideal for system consolidation and IT environment simplification. It provides mid-sized companies a flexible consolidation platform for multiple applications and operating environments. It provides a 1- to 4-way processor with Capacity on Demand. The i550 is available in Standard, Enterprise, Domino/Workplace, Solution, and now High Availability offerings. Additional characteristics include:

- Up to 64 GB DDR2 memory
- Up to 39 TB disk
- Up to 40 LPARs
- i5/OS V5R3 and V5R4

The System i5 570 is ideal for growing medium to large enterprises. The i570 offers multi-platform management and maximum flexibility for clients requiring up to 16-way symmetrical multi-processing capability. Its simplified product offering helps large companies consolidate multiple operating system environments. It extends the flexibility in i5/OS and enterprise enablement licensing. The system starts at a 2-/4-way and has upgrade options through the System i5 595. Characteristics include:

- Up to 512 GB DDR2 memory
- Up to 193 TB disk
- Up to 160 LPARs
- i5/OS V5R3 and V5R4

The System i5 595 is designed for medium to large enterprises and is the largest system in the System i5 family. The i595 offers highly scalable transaction processing and multi-platform management with maximum flexibility for large enterprises requiring up to 64-way server. It includes the new Optimum Care services to assist in successful deployment of complex implementations. New options for scalable IO expansion include up to 96 IO towers and up to 31 high speed link (HSL2) loops on both the 1.65 and 1.9 GHz i595 systems. Additional characteristics include:

- Up to 1 TB DDR1 memory
- Up to 381 TB disk
- Up to 254 LPARs
- i5/OS V5R3 and V5R

The IBM System i5 Optimum Care, which comes with all Standard and Enterprise edition 595s, provides services to optimize your large and complex system deployment. It can:

- Assist clients deploying large and complex systems
- Coordinate a broad range of proven IBM skills and processes
- Promote best practices to help reduce project risks and costs

Optimum Care is also available on a limited basis to clients with the i570 8/16 way. Table 1-1 gives details on System i5 Optimum Care.

Table 1-1 System i5 Optimum Care

Model	Eligible Editions	Upgrade Eligible?	Included?	Education and Services Included
595	Enterprise Standard	Yes	Yes	► Up to 160 hours of Project Management Services ► Improved Availability Technology Checkup to assess system health and availability ► Five ITES Education Vouchers
570	Enterprise	No	Upon Request	► Either 1 Enterprise Edition Service voucher ► Or up to 160 hours of Project Management Services ► Or improved Availability Technology Checkup ► And three ITES Education Vouchers

1.4 i5/OS V5R4 value proposition

Just as the innovations with the new System i platform are important, the new i5/OS V5R4 has made many enhancements promoting solutions innovation by:

- Helping companies exploit new business opportunities with proven, industry specific solutions.
- Helping integrate people, data, and processes from multiple sources across a company's value chain.
- Providing better access to information to help increase employee productivity and improve responsiveness to client requests.
- Enabling ISVs to integrate with IBM middleware and a broad range of popular open tools.

1.4.1 Promoting solutions innovation

Solutions innovation is important to clients because it allows them to solve current business problems and to grow their business. The i5/OS V5R4 promotes solutions innovation with technical capabilities such as:

- Improving application portability and memory footprint with the new 32-bit Java Virtual Machine (JVM™), allowing Java applications to run more efficiently on a wider range of systems.

  The new 32-bit i5/OS JVM V1.5 is expected to reduce the memory footprint for Java applications, which is valuable on the smaller systems. This JVM will be supported in WebSphere Application Server 6.1. This is a standard IBM JVM with consistent tooling and tuning options. Using the JVM is simple to implement without code changes for the majority of applications.

  The classic 64-bit JVM will continue to offer best scalability and performance for large enterprises with i5/OS V5R4.

- Simplifying database administration, performance management, and index maintenance with new DBA tools and enhancements to database tools. These capabilities simplify database administration, improve database response and make it easier to create and maintain your database. Other enhancements include:
  - Resource governor, which helps control resource intensive queries
  - The new real time index advisor and related tools to manage index rebuilding
  - Enhanced tools to monitor and analyze SQL performance
  - The new health center advising on the use of database
- IBM WebFacing Deployment Tool for WebSphere Development Studio V6.0.1 with Host Access Transformation Services (HATS) technology delivers an integrated modernization solution for the IBM System i5 marketplace. It is a runtime enabler allowing the Web Facing Tool and HATS technologies to work together in an integrated fashion. Both WebFacing Tool and HATS Toolkit clients can work seamlessly with their existing projects, while taking advantage of the new capabilities when combined with i5/OS V5R4.
- IBM WebSphere Development Studio for iSeries V5R4 is a comprehensive suite of application development tools for both e-business and i5/OS server development. This suite of tools contains server and workstation components that are optimized for i5/OS development. You can use WebSphere Development Studio for iSeries to create new e-business applications and to quickly and easily convert existing business applications that run on WebSphere Application Server. In addition IBM WebSphere Development Studio Client Lite is available (a preview) to develop i5/OS applications.
- Simplifying RPG application deployment as a Web service enabling broader access to existing applications and their associated data.

  Deploy an RPG application as a Web service *provider* making it available to others. It uses the SOAP engine in WebSphere Application Server and a Java wrapper to the RPG application. With i5/OS V5R4, a new wizard in WebSphere Development Studio Client generates a Web service from RPG source in a single step.

  You can enable an RPG application as a *requester* to a Web service by linking your core application to Web applications and services provided by others. Now, the XML Toolkit provides open application program interfaces (APIs) based on Apache AXIS to connect RPG out to a Web service.
- Enabling the use of free-form SQL in RPG applications using IBM WebSphere Development Studio for iSeries V5R4, which simplifies application development by making database access easier to code.
- Extending Control Language (CL) productivity and development options with subroutines and support for new pointer variables makes an even stronger application development language than before.

  With CL enhancements in V5R3, CL became a stronger application development language. Now with V5R4, CL is further enhanced with:
  - Support for simple subroutines that reduces code repetition
  - New pointer data type and based CL variables open up your options to call other programs or system APIs
  - Support for data structures in CL using defined variables

  CL can now take advantage of the wide range of APIs shipped in i5/OS programs and service programs.

1.4.2 Integrating with other systems and operating environments

With i5/OS V5R4, you can simplify your IT environment by improving the integration with other systems and other operating environments:

- Support SNA applications over IP networks with i5/OS Enterprise Extenders, which use a widely supported industry standard.

  Enterprise Extenders enable businesses to run existing SNA applications over an IP network without the expense of a parallel network. These extenders also support existing applications over new generations of routers and network equipment that do not support System Network Architecture (SNA). The Enterprise Extenders benefit your IT environment by improving performance verse using an AnyNet® alternative and by supporting a broad range of SNA protocols and applications.

- Improving integration with Microsoft Windows applications with enhanced ODBC, OLE-DB, and .NET support. This gives Microsoft users the ability to continue using .NET for existing applications while greatly increasing their opportunity to take advantage of what the System i platform and i5/OS have to offer for their future growth.

1.4.3 Promoting business resilience and compliance

The i5/OS promotes business resilience and compliance, which is critical to minimizing outages of any kind (planned or unplanned) and making them transparent to business operations. The i5/OS safeguards data by keeping hackers and viruses out of the system. It also promotes the highest levels of security, auditing, and compliance management. The i5/OS delivers proven technology that is backed by world-class service and support.

With i5/OS V5R4, IBM takes support for business resilience and compliance a step further:

- Integrity protection, network intrusion detection, and auditing enhancements help improve security and compliance.
- i5/OS hardware storage protection helps protect company data.
- Concurrent firmware and nondisruptive fixes help deliver continuous operations.
- Improved backup flexibility with virtual tape support, that enable reliable, high-speed backups directly to disk using your normal save/restore functions.

  This function can reduce the scheduled save windows, increasing scheduled production hours of operation. Virtual tape files can then be moved from disk to physical tape cartridges while end-user applications are in production. Other save/restore enhancements include:

  - Ability to directly back up and recover spool files
  - Use of parallel save and restore for files in the integrated file system
  - Avoiding downtime associated with a periodic save of your system data

- Journaling enhancements reduce disk or network resources and improve auditor monitoring.

  i5/OS replication service now (optionally) automatically journals non-database objects in addition to new database files. A new journaling option helps auditors view data in journal entries minimized to improve performance.

- Additional clustering enhancement aid the administrative system domain.

  This enables synchronization of environmental objects, such as user profiles and system values or attributes across nodes.

- Incorporates RAID 6, an extension to RAID 5, to improve disk protection.

  It uses a second, independent distributed parity scheme where data is striped on a block level across a set of drives. Then a second set of parity is calculated and written across all of the drives. This approach provides extremely high fault tolerance and can sustain several simultaneous drive failures, but it requires an "n+2" number of drives and a very complicated controller design.

Key additions to security and compliance in i5/OS V5R4 support:

- System integrity by helping to protect company data using i5/OS hardware storage protection.
- Access control by helping companies secure systems with additional auditing features, such as recording special authority violations and preventing display of user audit attributes.
- Network security by helping prevent network attacks with Transmission Control Protocol Internet Protocol (TCP/IP) intrusion protection, which can be configured to create audit journal entries for events such as port scans. And by extending support for virtual private networks (VPNs) with server side Network Address Translation (NAT) traversal.

  VPN support on i5/OS is enhanced to establish VPNs that traverse one or more NAT firewalls. Previously, i5/OS VPN provided this ability when the i5/OS is the client/initiator of the VPN connection. Now, VPN support enables VPN NAT traversal when i5/OS takes the role of the server/responder of the VPN connection. With this enhancement, i5/OS VPN support provides a complete solution for allowing VPNs through NAT firewalls.

1.4.4 Enabling ISVs

ISVs have always played an important role for the System i and its predecessor systems by bringing business applications and additional tools and capabilities to the offerings. Clients want solutions that enable them to run and grow their businesses. The client focus is on selecting the solutions that meet their business needs. System i family through its partnerships with ISVs and tool providers provide these solutions on a robust and sound foundation.

All of the improvements in the i5/OS V5R4 and the new System i platform enable ISVs to develop and sell their applications on this robust and integrated system containing many advanced capabilities. The i5/OS V5R4 provides many features to make application development easier for developers. One such feature is the 32-bit Java Virtual Machine (JVM) 1.5 mentioned previously, which is being deployed as a standard across all IBM systems. The 32-bit JVM is used on many Windows and Linux platforms, enabling ISVs to take advantage of a consistent set of configuration and service tools. With its smaller footprint, improvements in performance are possible on the smaller systems.

The IBM middleware allows ISVs to integrate with and extend the middleware's existing capabilities with additional functions particular to client or industry needs. IBM embraces a broad range of popular open source tools and technologies that allow ISVs to create solutions and tools with the assurance that their investments have broad appeal and long term value.

IBM also promotes the ISVs and tool providers and their products through the System i Initiative for Innovation, discussed in Chapter 2, "Introducing IBM System i Initiative for Innovation" on page 11. This program is a cooperative and collaborative effort between IBM and ISVs to ensure they provide the best products and services to the client on the System i. IBM brings forward its products and skills in hardware, operating system and middleware to ISVs and tool providers to use as a base for their solutions. And ISVs and tool providers bring their knowledge of industries and client requirements to provide clients with the solutions and

capabilities they need to run and grow their business. While this statement may be passe, it is a win/win/win situation for clients, ISVs and tool providers, and IBM.

For more details on the IBM i5/OS V5R4, refer to:

http://www.ibm.com/common/ssi/OIX.wss?DocURL=http://d03xhttpcl001g.boulder.ibm.com/common/ssi/rep_ca/5/897/ENUS206-015/index.html&InfoType=AN&InfoSubType=CA&InfoDesc=Announcement+Letters&panelurl=&paneltext=

2

Introducing IBM System i Initiative for Innovation

This chapter introduces the IBM System i Initiative for Innovation and its three foundation programs:

- Application Innovation
- Tools Innovation
- System i Innovation

The chapter also discusses the System i Developer Roadmap with subcategories, so independent software vendors (ISVs) and clients can more easily understand what tools are available to help them modernize and integrate their applications.

2.1 Introducing the System i Initiative for Innovation

The IBM System i team understands that in order to provide the best solutions to clients, they must provide tools from both IBM and independent software vendors (ISVs). ISVs and tool providers enrich the System i platform and i5/OS with additional and enhanced capabilities, a wide range of business applications and additional innovative services.

IBM ISVs and Business Partners have always delivered a large portfolio of leading, industry-specific solutions to clients. In the past year, hundreds of ISVs joined with IBM to enhance and extend their applications to meeting today and tomorrow's business challenges. This effort resulted in a revitalized and innovative System i solutions portfolio. As of early 2006, there are over 600 new i5/OS solutions and over 220 IBM ServerProven tools highlighted on the System i Developer Roadmap.

The IBM Charter for System i Innovation (shown in Figure 2-1) defines the System i programs goals and objectives. The three key areas being focused on are:

- Solutions
- Innovation
- Partnership

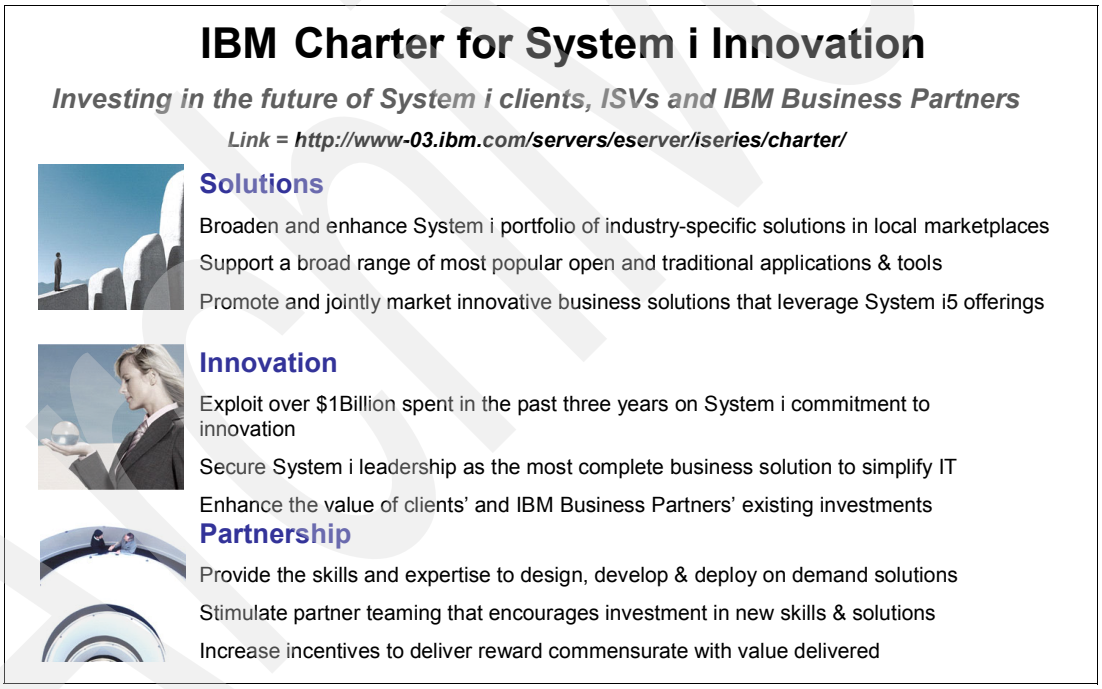


Figure 2-1 IBM Charter for System i Innovation

2.2 System i Initiative for Innovation program

The System i Initiative for Innovation provides ISVs with a rich set of enablement and go-to-market resources to help expand the solutions portfolio, reach new markets, and support more clients. Figure 2-2 identifies the System i Initiative for Innovation and its three core programs, which are:

- Application Innovation: Offers ISV enablement support services, such as architectural support, education offerings, and testing support, to help ISVs extend and strengthen application offerings by adopting new technologies.
- Tools Innovation program: Has options for System i developers that want to evaluate, learn, and use both IBM and ISV tools for developing, deploying, integrating, and managing ISV and client solutions.
- System i Innovation: Is about building a stronger System i community. As an ISV, it gives you a voice in key business solutions requirements by industry, technology, and geography through access to IBM development teams and councils.

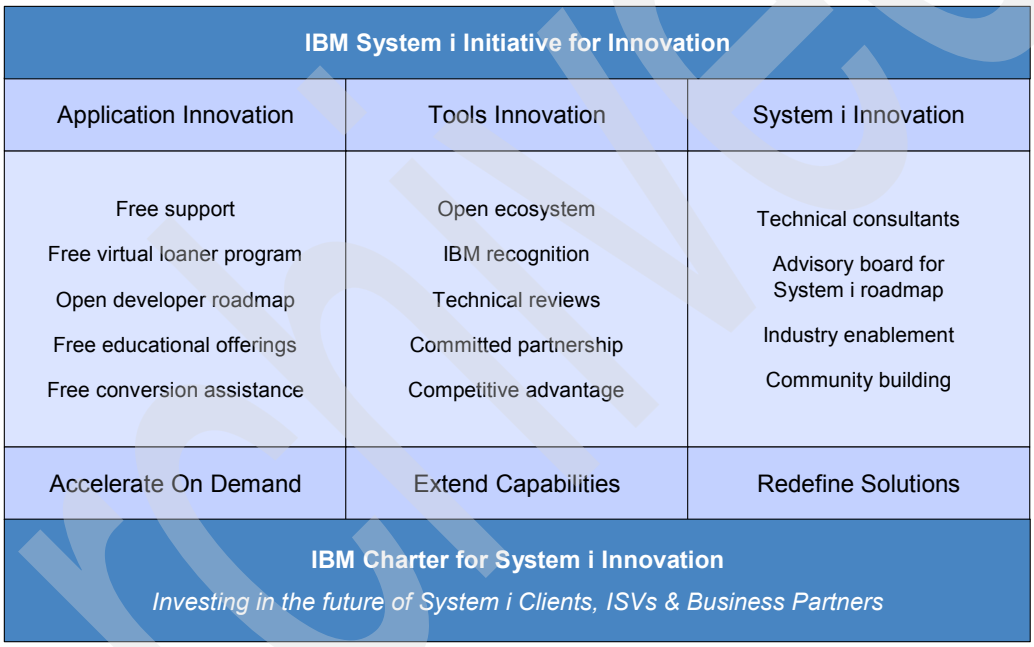


Figure 2-2 IBM System i Initiative for Innovation program

The Initiative for Innovation focuses on accelerating ISV growth and building your competitive edge. You have various ways to take advantage of the program:

- You can register and select the offering that best match your business needs.
- You can begin with a solutions assessment with an IBM enablement specialist who will help you map out your modernization and education plans.
- You can request technical assistance to help you port, test, and deploy your Windows or Linux-based application on the System i platform.

When ISVs need IBM to help with either technical or marketing support, you can select the programs that best fits your needs. This program is an open collaborative effort that is designed to help you address both your enablement and marketing requirements, enabling you to continue to deliver innovative solutions to clients.

Figure 2-3 provides a summary of the programs and activities within each program.

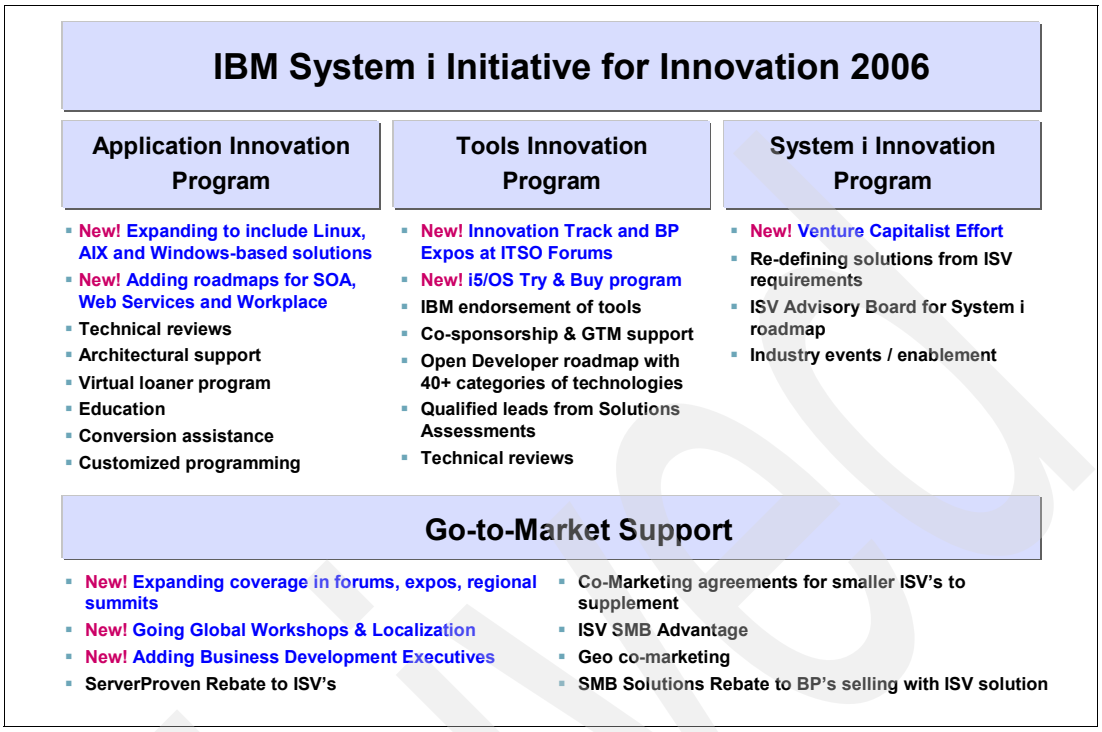


Figure 2-3 Program activities

2.2.1 Application Innovation program

The System i platform holds a well-deserved reputation for delivering leading, industry specific business applications. The System i Initiative for Innovation has created a value chain that starts with IBM helping ISVs accelerate the delivery of new, innovative applications and solutions built on the industry leading technologies. These applications and solutions, in turn, help clients to meet the demands on their business. This makes them more responsive to their employees' need for applications and data and their clients' need for information. These innovative solutions also help clients refocus their investment from maintaining and managing IT to growing their business.

Through the Application Innovation program, you can:

- Choose to start with a personalized conference call where IBM technical consultants answer your System i technology questions.
- Use enablement roadmaps, consisting of technical and marketing resources, to guide you through implementing a System i solution.
- Take advantage of face-to-face technical assistance to assist in developing, porting, deploying and testing your application on the latest System i hardware, software, and middleware.

In 2006, you can select from an expanded portfolio of enablement offerings. The Application Innovation program includes support for i5/OS, Windows, Linux, and AIX-based solutions. New roadmaps for service-oriented architecture (SOA), Web services, and Workplace/Collaboration have been added this year. There will be new roadmaps and new technologies added throughout the year.

For additional information, refer to:

http://www.developer.ibm.com/vic/hardware/portal/iii_pages/iii_applinnov_index

2.2.2 Tools Innovation program

The Tools Innovation program mission is to drive better solutions by providing tools that developers need to develop, test, debug, integrate, and deploy those solutions. By providing excellent System i tools (available from both IBM and ISVs), clients can extend and enhance the capabilities and increase the business benefit of their applications.

Tools Innovation is defined in terms of the business needs of our clients, not just in terms of the products IBM sells or the standards IBM chooses. IBM's objective is to help extend and add value to all solutions, regardless of their underlying programming language, such as RPG, COBOL, or Java.

These extended and enhanced business solutions take advantage of advances in technology by:

- Extending applications to the Web
- Incorporating technologies, such as radio frequency identification (RFID)
- Enabling wireless device access to server-based business applications and data
- Integrating a client's supply chain via Web services

These innovations are all about helping ISVs and clients gain competitive advantage through the use of innovative ideas and capabilities from IBM and our System i tool providers.

The Tools Innovation program now has 114 members with 220 solutions featured on the System i Developer Roadmap.

This open approach to establishing a solutions community highlights both IBM ServerProven ISVs and IBM tools on the System i Developer Roadmap. Clients and ISVs can benefit from this broader view and the broader support of these System i tools. And they can be assured that IBM has recognized that System i ISVs are delivering innovative tools designed to enhance, improve, extend, and better integrate existing solutions.

2.2.3 System i Initiative for Innovation program

The System i Initiative for Innovation program is designed to enable even greater client business value. Adding new applications and extending existing applications is important to enable business growth and enhance competitive advantage.

The System i Initiative for Innovation program can help companies refocus their investment on the business and simplify IT. This is critical because many companies spend increasing amounts of money and time managing complex IT environments with complex configurations, too many servers, or uncontrolled server growth. These complex and complicated IT environments frequently drain money and resources from other business growth and innovation activities.

The Initiative for Innovation program is all about building community. This is accomplished through greater access to the technologies and capabilities at the IBM Innovation Centers, as well as improved access to the System i developers in Rochester, MN. At the same time, work on key marketplace insights and critical success factors is shared in an effort to help meet ISVs and clients' needs in faster and smarter ways.

This program is designed to deepen the IBM relationship between the System i ISVs to enable greater client value and growth.

For more details, refer to:

http://www.ibm.com/servers/eserver/iseries/innovation/systemi5.html

2.3 Introducing the System i Developer Roadmap

The IBM System i Developer Roadmap shows how traditional applications can be modernized and enhanced to incorporate new programming languages, technologies, and methodologies. The roadmap, through its various steps (as shown in Figure 2-4), focuses on application modernization and the integration of a wide variety of new devices, technologies, and capabilities that help you grow your business, solve business problems, and gain competitive advantage. This wide variety of new devices, technologies, and capabilities includes items such as Web browsers, mobile devices, and Radio Frequency ID (RFID) infrastructure.

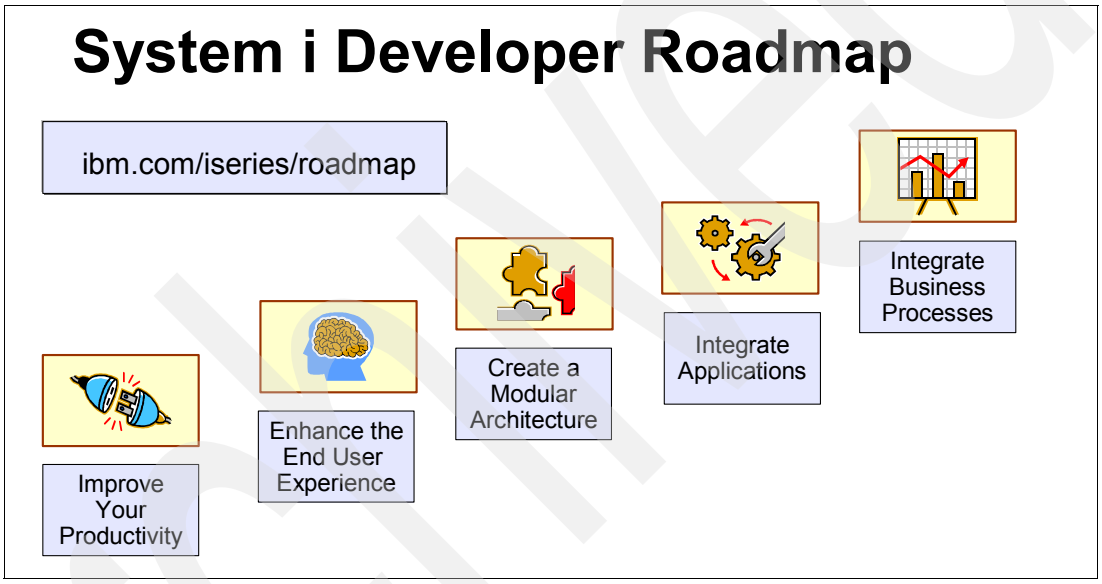


Figure 2-4 System i Developer Roadmap steps

Application modernization is an investment journey that takes existing business applications and integrates them with new technologies and the open architecture of the Web. The application modernization effort allows you to drive your business forward and to take advantage of the almost unlimited possibilities for developing business value by integrating new technology and new methodologies.

IBM provides the System i Developer Roadmap as a means to help guide clients and ISVs on this journey. The roadmap is a set of discrete, achievable steps that modernizes the skills of your developers and the capabilities of your applications, while helping you transition your existing application. These steps also consciously help you minimize the risk involved in this activity. Each step in the roadmap provides discrete business value, so you can decide which steps to implement according to your business needs.

The roadmap works hand-in-hand with the System i Tools Innovation program. The roadmap relies on the Tools Innovation program to identify the tools (from IBM and ISVs) and software platforms to help ISVs and clients maximize their modernization strategies and goals.

The roadmap provides a step-by-step approach in taking a RPG, COBOL, C, C++, and Java application and building the necessary extensions to help ISVs and clients adopt and

integrate the latest technologies. Figure 2-5 shows the steps in the roadmap and gives ISVs and clients the positioning of these technologies in the various steps.

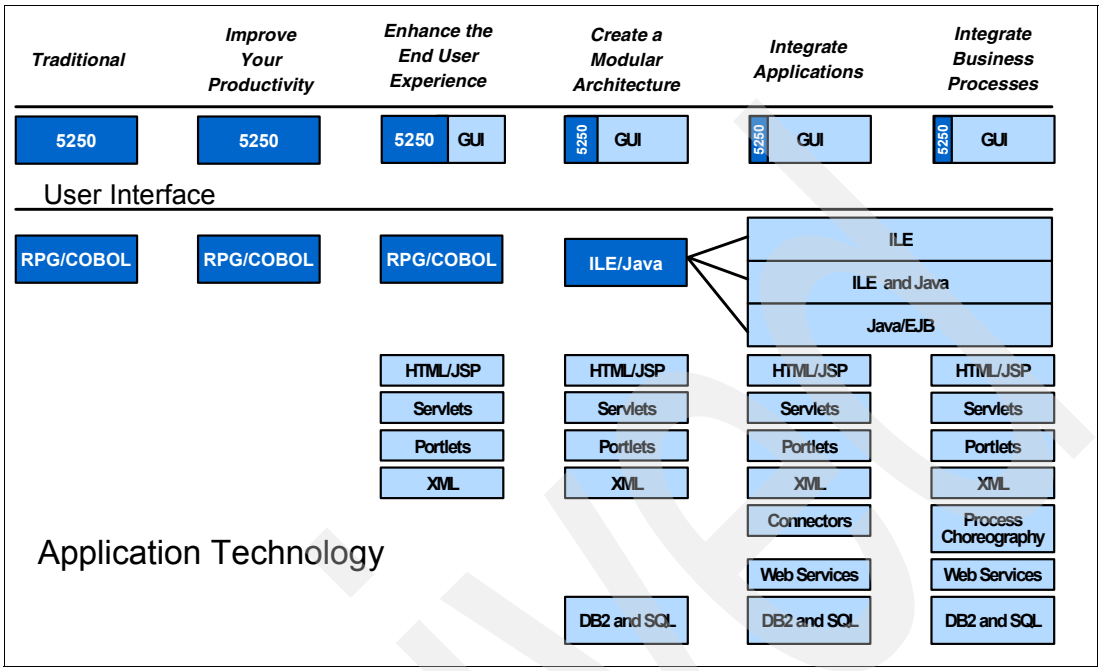


Figure 2-5 System i Developer Roadmap application technology

As shown in Figure 2-5, there are various paths and packages that can be followed based on ISV and client requirements and industry needs. The steps are:

- *Improve your productivity:* Use integrated development environments (IDEs) with graphical presentation, desktop capabilities, and integrated test/debug, giving your developers the power to concentrate on business logic, new functionality, and incorporating new technologies.
- *Enhance the end-user experience:* Gives the developers the tools and process to take their application presentation to the next level with a browser, client-server, or a mobile device.
- *Create a modular architecture:* Separates the user presentation, business logic, and database access, creating reusable application components, callable interfaces, and database callable modules.
- *Integrate applications:* Adopts new technologies, optimizing access to applications, business logic, and database information while integrating applications maximizing reuse.
- *Integrate business processes*: Enable systems and applications to work together, connecting with suppliers and clients to achieve process efficiencies, better communications, and improved service.

The roadmap provides various learning paths to allow developers build skills in new technologies. To obtain more information about these learning paths, refer to:

`http://www.ibm.com/servers/eserver/education/cust/iseries/paths/j2ee/ests_isli_j2ee_index.html`

To better understand the roadmap from an independent review, refer to:

`ftp://ftp.software.ibm.com/common/ssi/rep_wh/n/ISW00197USEN/ISW00197USEN.PDF`

2.3.1 System i Developer Roadmap with subcategories

To take advantage of the System i Developer Roadmap, IBM, through its System i Tools Innovation program, has created a tools view of the roadmap via subcategories. This view identifies tools and technology (in general terms) that can be used to enhance your application modernization effort. Figure 2-6 shows the Tools Innovation view of the roadmap.

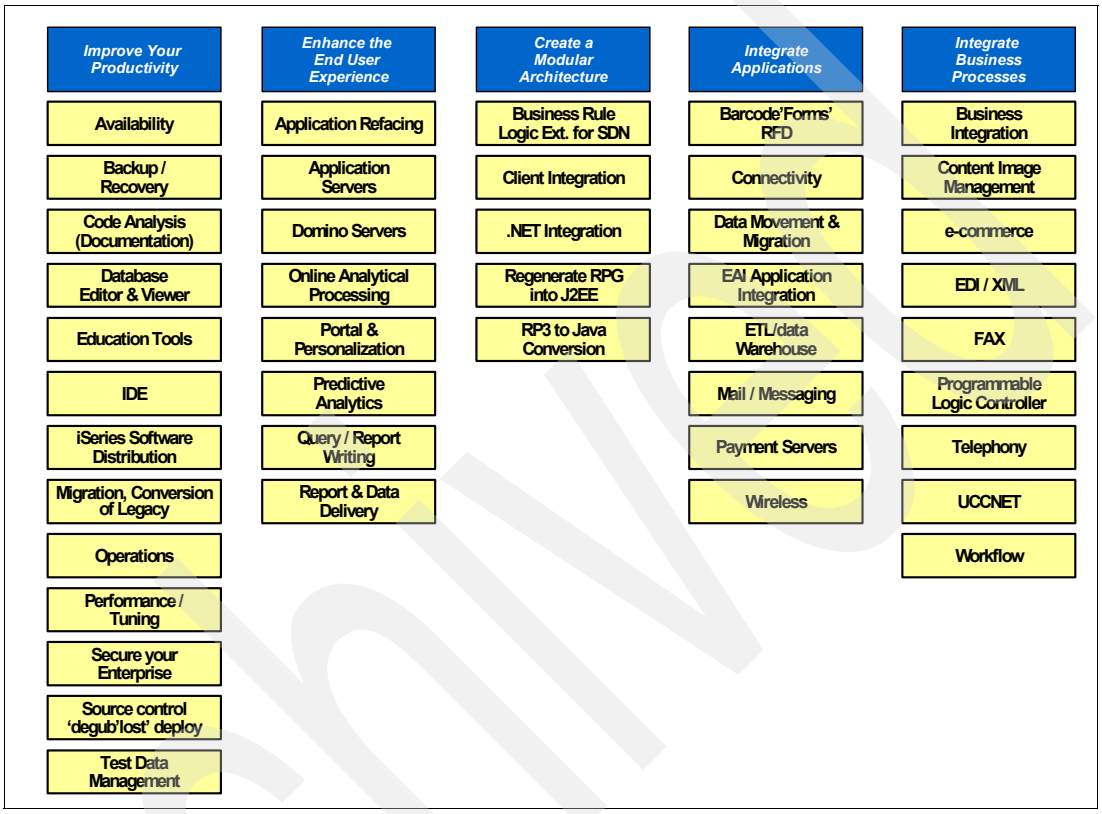


Figure 2-6 System i Developer Roadmap - Tools Innovation View

The Tools Innovation program takes the usability of the roadmap a step further by identifying IBM and ServerProven ISV tools for each of the subcategories within each step. This open approach to the application development life cycle and application ecosystem provides ISVs and clients with the resources they need to achieve their business strategies. The following chapters identify the tools and software platforms specifically related to application modernization and integration.

3

IBM ServerProven tools for application modernization and integration

This chapter introduces independent software vendor (ISV) provided tools for application modernization and integration. These ISVs are members of the System i Tools Innovation program and endorsed by the IBM ServerProven Program.

3.1 IBM ServerProven ISV tools

The IBM ServerProven Program is based on this simple idea: give clients the confidence that all parts of their solution, hardware, software and middleware, that installs quickly, starts up easily, and runs reliably. Software with the ServerProven emblem ensures that it has been identified, validated, optimized, and documented to run reliably on IBM servers.

The solutions bearing the ServerProven designation have been implemented in a real-world, production environment. By considering ServerProven solutions, clients can learn about real-life installation examples that can help promote confidence in selecting ServerProven software applications to run on IBM platforms.

When you see the ServerProven emblem:

- At least one end-user client has installed the solution, and it is running on an IBM system.
- Independent solution vendors (ISVs) have demonstrated activity indicating the enablement of their solution on IBM @server™ servers.
- Clients who purchase ServerProven solutions can take advantage of special offers and rebates from IBM. These can help make choosing IBM server products easier than ever.

The Solution Connection is a place to find solutions that combine software from leading ISVs with IBM hardware, software, and TotalStorage® technology. Solution Connection also displays ServerProven and TotalStorage Proven™ solutions that may be eligible for special rebates and offers.

To obtain more information about ServerProven, refer to:

http://www.pc.ibm.com/ww/eserver/xseries/serverproven/

Legal Notice:

The ISV tool descriptions provided in this chapter is taken from the Solution Connection Web site:

https://www.ibm.com/servers/solutions/finder/portal/search.jsp

Please review the “Legal Disclaimer” on page viii regarding ISV tool descriptions.

3.2 System i Tools Innovation program

The System i Tools Innovation program recognizes ISVs tools and includes ISV and IBM tools to provide ISVs and clients access to a broader choice of high quality tools. A key goal of the Tools Innovation program is to help clients and ISVs modernize and extend their applications and integrate their applications with other operating environments.

The System i Tools Innovation program is associated with the IBM ServerProven Program, sharing a common goal of providing tools that enable clients and ISVs to create viable solutions. Also, the Tools Innovation program is aligned with the System i Developer Roadmap, identifying tools within each roadmap step. The Tools Innovation program provides tools to support the various steps in the roadmap:

- *Improve your productivity*: Identifies integrated development environments with graphical presentation, desktop capabilities, and integrated test/debug.
- *Enhance the end-user experience*: Encompasses taking the application presentation to the next level with browser, client-server, and pervasive technologies.

- *Create a modular architecture*: Provides vehicles to separate the user presentation, business logic, and database access, creating reusable application and database callable modules.
- *Integrate applications*: Provides tools for adopting new technologies, optimizing access to applications and business logic, and integrating applications maximizing reuse.
- *Integrate business processes*: Allows systems and applications to work together, connecting with suppliers and clients to achieve efficiencies, better communications, and service.

For details on the Tools Innovation program, refer to:

http://www.developer.ibm.com/vic/hardware/portal/iii_pages/iii_tools_innov_index

3.3 Tools to improve your productivity

As defined by the System i Developer Roadmap, the *Improve your productivity* step identifies integrated development environments with graphical presentation, desktop capabilities, and integrated test/debug, which enable developers to modernize existing applications. The subcategories of this step are:

- Availability: Tools used to provide “hot” backup systems that allow a client to continue to operate if their primary system fails.
- Backup/Recovery: Tools used to manage scheduled backup and manage the media used for the backup, to facilitate application recovery after a failure.
- Code analysis, documentation, and tracking: Tools for analysis of code that provide documentation and tracking information for use by developers. This supports modernizing existing applications by moving existing applications to modular code.
- Database editor and viewer: Tools for viewing, managing, and accessing DB2/400 data.
- Education: Tools to assist with delivery of education.
- Help desk: Tools for help desks.
- Integrated development environments: Integrated tools for creating and maintaining new and existing applications.
- Migration/conversion of existing tools: Tools for migrating and converting System 36 and AS400 code to iSeries, RPG, COBOL, and ILE.
- Operations: Tools that enable planning, distribution, evaluation and control of work in a system or network.
- Performance/tuning: Tools for optimizing the performance of applications, servers, databases, or networks.
- Secure your enterprise: Tools that work with or extend OS/400® security resources for both local and network resources.
- Source control/debug/test/deploy: Tools to support development, and managing control of source code, testing, debugging, and deploying of code.
- Test data management: Tools to create, amend and maintain accurate test data for application testing, support and training.

The two subcategories that apply directly to modernization and integration are:

- Code analysis, documentation and tracking tools
- Integrated development environments

3.3.1 Code analysis, documentation, and tracking tools

Code analysis, documentation, and tracking tools enable analysis of existing application code and provide documentation and tracking information for use by developers. Often, documentation and details about existing applications are out-of-date or non-existent, making the modernization of existing applications very difficult. Over the years, tools have been created to aid in understanding these applications. The tools in this subcategory support the modernization of existing applications by helping developers understand the existing applications. With this knowledge, the developer can identify the appropriate application code to retain and convert into modules. Modular code provides the advantages of code reuse and simplifies application maintenance by allowing the developer to make code changes in one place rather than in multiple places, which is often the case with existing applications.

ISVs tools that support code analysis, documentation, and tracking are listed (in alphabetical order by company name):

- ABSTRACT, by Advanced Systems Concepts, provides an integrated set of cross-referencing, documentation, and programming tools for AS/400 and iSeries systems. ABSTRACT is integrated within WebSphere Development Studio for iSeries. A 5250 (green screen) version is also available. ABSTRACT may be used from three different user interfaces (all versions use the same cross-reference database resident on the server and all versions are included in the license fee):
  - WebSphere Development Studio for iSeries
  - iSeries Navigator
  - 5250 Host (green screen)

  For more details, refer to:

  `http://www.asc-iseries.com/abstract/index.htm`
- ARCAD-Observer, by ARCAD Software, gives you an instant, overall, and complete view of your information system, based on a repository and powerful cross-reference tools with a user-friendly graphical interface. Your technical documentation is automatically generated and customizable to internal/external standards, which extends the lifetime of your information system. ARCAD-Observer is an invaluable tool in application re-engineering, as it reveals the internal architecture of your applications, and extracts the business rules from existing code. Its powerful impact analysis features bring major productivity gains to maintenance tasks, as the affected areas of code are exhaustively identified down to the source-line level. ARCAD-Observer also supports audit requirements, providing comprehensive and fully customizable retro-documentation, covering both detailed program structure, flowcharts, program calling chain, input output (I/O) previews, I/O diagrams, application workflow diagrams, database relationship diagrams, DDL scripts, cross-references, field directory, modified fields (by file), user functions, referenced message IDs, file usage diagram, and dependent files. Once the documentation has been generated in HTML format, you can export the resulting documentation to your intranet to be shared by a wide range of users (development, quality assurance, or support staff, for example). These users have no need for an ARCAD-Observer licence, or any prior programming knowledge.

  For more details, refer to:

  `http://www.arcadsoftware.com/produs_observer.htm`

- X-Analysis, by Databorough, is a full cycle development tool kit, and world leader in iSeries application retro-documentation. It will extract business rules from your RPG/LE, with a full data model, move you to Java, and supply you with a Web deployable user interface (UI). It will also give you complete and instant graphical documentation of what the application is supposed to do, and supply you with a full test environment with data rollback ability, all done programmatically. Whether you just want to document your entire system from the early 80s, or deploy that same product on the next generation of IBM servers, X-Analysis is the tool kit that you need. It has the following features:
  - Reverse engineers data models
  - RPG/COBOL/JAVA cross-referenced together
  - Views RPG as pseudo code
  - Documents business rule logic
  - Generates business rule server programs from existing code
  - Reverse engineers Java Server Pages (JSP™) or JavaServer™ Faces (JSF) or Active Server Pages (ASP) Web user interfaces from existing programs
  - Converts existing I/O into Java/SQL
  - Integrated data analysis
  - Documents your entire system instantly and automatically
  - Plugs into WebSphere Development Studio Client with new Web projects from converted components
  - Integrated data analysis
  - Exports to XMI, DDL, Microsoft Word, and Visio®

  For more details, refer to:

  http://www.databorough.com/
- RPG-Alive, by Profound Logic Software, provides a variety of capabilities to explore, understand and change your existing RPG code. You can see the RPG or Control Language in a real-time outline, and see each modification using online delineation. RPG context sensitive help is also available. Other features include:
  - Cursor navigation
  - Marking of line commands
  - Highlighted comments
  - Delimited subroutines
  - Indented printouts of your RPG or CL source

  For more details, refer to:

  http://www.rpgalive.com/
- SMI SuperVisor, by Software Management, Inc., is used to interrogate the operating system and extract object attributes and system information. This data is stored into a common format that can be used to drive further processing. This analysis can be scoped across several systems. Because the stored data can be used to drive additional processing, iterative or nested analysis can be performed and corrective actions can be automated.

SuperVisor Major Components include:

- Systems analysis
- Cross-reference
- Online object analysis
- Source management
- Test data management
- Security analysis and management

For more details, refer to:

http://www.smisupervisor.com/

3.3.2 Integrated development environments

Integrated development environments (IDE) allow you to create and maintain new and existing applications. An IDE enables application developers to modernize applications by having tools for the complete development life cycle all in one place. These tools are also valuable when extending or integrating applications. The ISVs tools included in this subcategory are (in alphabetical order by company name):

- Strategi, by ADVANCED BusinessLink Corp., is the technology-leading, 100% native AS/400 e-business solution. It offers a powerful array of capabilities that form a path from AS/400 existing emulation to the development of Web-based applications. This is done using existing skills and business logic, thereby saving money and avoiding steep learning curves associated with many of the new Web technologies. Strategi's thin-client approach to host access replaces the traditional thick-client model for emulation, file transfer, and printing within a browser. Taken a step further, Strategi provides opportunities for companies to consider any personal computer (PC), cell phone, pager, or personal digital assistant (PDA) as an interactive AS/400 device.

  For more details, refer to:

  http://www.advancedbusinesslink.com/PRODUCT/strategi/homepage.htm

- Strategi Web Services, by ADVANCED BusinessLink Corp., has capabilities to extend the iSeries and Strategi platform into the realm of XML based integration with other applications or other partners.

  Strategi Web services capabilities enable a firms development team to rapidly deliver SOA based technologies that can be integrated with client and partners.

  For more details, refer to:

  http://www.businesslink.com/product/strategi/webservices/homepage.htm

- ASNA Visual RPG Classic, by ASNA, is an RPG development environment for Windows that is based on Component Object Model (COM) technology. COM is a Microsoft programming model that has been in existence since the early 1990s. AVR Classic is currently in use, in thousands of shops worldwide, and is primarily used for creating Windows applications that connect, without change, to IBM AS/400 and iSeries servers, Microsoft's SQL Server, and ASNA's Acceler8DB Classic database that resides on Windows desktops and servers.

  For more details, refer to:

  http://www.asna.com/pages/products_classic.aspx

- WebSmart, by Business Computer Design, is a fast and easy to use PC based iSeries Web and wireless development tool. You can quickly and automatically produce dynamic HTML CGI programs in ILE RPG or Java servlets, from one effort. You can also do development using the PC based design tool that integrates seamlessly with your database files. Other capabilities include:
  - Wizards, templates, and cascading style sheets make development fast and easy.
  - Generated applications run at optimal speed with minimal system resources.
  - Customizable to minimize repetitive programming, using existing code logic, and using your corporate standards.
  - It is easy to learn and implement.
  - You can develop and run programs in the first hour.
  - No additional OS/400 or third-party Web software is needed; WebSmart uses standard Hypertext Transfer Protocol (HTTP) server, either the original HTTP Server or HTTP Server (Powered by Apache) or Apache with Tomcat or IBM WebSphere.
  - Utilizes iSeries database and security features for scalability and reliability.
  - There are optional RPG and data description specifications (DDS) to Web conversion tool.

  For more details, refer to:

  http://www.bcdsoftware.com/progenwebsmart.htm
- GeneXus, by GeneXus, is a revolutionary, model-driven software development tool that combines agile database modeling, declarative business rules, and automatic code generation to deliver unprecedented value to developers targeting the iSeries. With GeneXus, you have a multi-platform software design and development tool that enables truly incremental development (100% automatic) for business critical applications, with no runtime costs. GeneXus ensures code quality, data consistency and integrity, plus generates native code and has no run-time cost.

  For iSeries clients, they will see up to a 500% increase in productively using GeneXus, and you have the ability to deploy for the iSeries (Java, J2EE™, Cobol, and RPG/ILE). GeneXus iSeries users have the freedom to develop using the latest technology available from Java. GeneXus supports the leading execution platforms (Java or .NET) and languages (Java, J2EE, and Ajax), and the most popular database management systems (DB2 UDB, SQL, Oracle, MySQL, and PostgreSQL.) GeneXus simplifies all this complexity. There is support for EJB™, EAR, and JTA, and the GeneXus generated Web applications are three layers, where the presentation logic is separated from the business and data logic, with support for Java, .Net, ANSI C, or Visual Basic®, with access to DB2, Oracle, SQL Server, Informix®, MySQL, or PostgreSQL. You can choose either IBM WebSphere or Jakarta Tomcat to be used for the middle-tier, plus you have simultaneous support of RMI, CORBA, or DCOM clients.

  For more details, refer to:

  http://www.genexus.com/portal/hgxpp001.aspx?2,3,43,0,E,0,MNU;E;1;1;MNU;,
- Real-Time Program Audits (RTPA), by Harkin Audit Software, Inc., is an easy-to-use software utility that shows programmers what really happens in any RPG program. RTPA turns any RPG source code into "audit-enabled" program objects (using the regular OS/400 compiler). When an audit-enabled program object is executed, it behaves exactly like its non-enabled original, except that it records every action it takes (source statements and variable values) in an audit file while it executes.

RTPA allow programmers to see, in real time, the source statements, record formats, data field contents, keys, key lists, and indicators used in any program, without setting breakpoints or having to intervene in the program's execution in any way. RTPA is the easiest, hands off way to see everything that is happening in your source code.

For more details, refer to:

http://www.harkinsaudit.com/products/products.shtml

- XBintegrator, by INVENSO, is a powerful and rich development environment that enables a smooth integration of eXtensible Markup Language (XML) and other data formats, with intelligent workflow, validation, exception handling, and integration with all OS/400 objects.

  XBintegrator advantages are:

  - Short learning curve
  - Very short time to deployment
  - High return on investment value
  - Shields complexity

  XBintegrator is an unique solution on iSeries and has:

  - Creation/handling of all kind of XML documents.
  - XBids (XBintegrator Development Studio), a multi-user and project based development environment with test/production support, code assistant and completion, help and wizard functions, drag and drop functions, SQL-builder, code generator, and schema creation/validation/comparison.
  - MQ integration.
  - JMS bridge.
  - Native IO or SQL database access.
  - E-mail integration.
  - Socket communication.
  - Optimized eXtensible Stylesheet Language Transformations (XSLT) functions.
  - Polling processes.
  - Extensive ZIP function.
  - Optimized integrated file system (IFS) and directory management.

  XBintegrator bridging modules include:

  - A database gateway that connects all other databases.
  - An IP protocol extender that connects over HTTP, HTTPS, MAIL, File transfer Protocol (FTP), and so on.
  - A system and resource manager that manages external devices.

  For more details, refer to:

  http://www.invenso.com/xb_integrator.php

- LANSA 2005, by LANSA, offers breakthrough application modernization, extension, and integration capabilities for information technology (IT) development teams and software vendors on multiple platforms, including the IBM @server iSeries.

LANSA 2005 is a powerful suite of application development and integration products that enables mid-sized organizations to overcome the complexity inherent in delivering tomorrow's applications. This release offers:

- Enhanced and extended Rapid Application Development Capability
- Out-of-the-box Support for Web Services
- One-click device support
- Any-to-any integration
- A broad array of solution options for clients

What makes this unique from other offerings in the marketplace is that the current IT staff can easily master LANSA 2005 to:

- Assemble composite applications from existing systems and databases
- Deploy to a browser or client/server n-tier solution
- Run on their platform of choice

For more details, refer to:

http://www.lansa.com/products/lansa2005.htm

- LANSA for the Web, by LANSA, is used to build Internet, intranet and wireless applications that securely access and update corporate data on your iSeries, Windows, Linux, or UNIX servers. LANSA's High Level Language allows you to rapidly generate industry standard graphical HTML and XHTML for both browser and wireless devices. Turn your Web application into a Web service with the simple click of a mouse.

  LANSA Web applications use the business logic you have defined in LANSA's Object Repository, which can automatically be reused with all other types of LANSA applications like Windows rich client, iSeries 5250, and Web services. This enables all your LANSA applications to ensure all information stored in your database has passed all the necessary integrity checks. The repository also reduces maintenance of these applications because rules are maintained in one spot and reused throughout the system.

  LANSA manages all the complexity of Web applications for you: state management, business rule validation, data conversion and integration with different Web servers and existing applications. Developers can focus on meeting business requirements. LANSA handles the technical complexities.

  For more details, refer to:

  http://www.lansa.com/products/weboverview.htm

- The Java Workflow Design Framework (JAWFLOW), by L.D. Consulting NV, is an environment based on Java to build rich-client business applications. The Swing-based user interface allows you to develop enterprise class applications that are highly interactive and feature rich. Combined with the i5 connector mechanisms, this framework hides the low-level technical complexities and allows the developer to focus on the applications at hand using rapid application development (RAD) techniques. Combine JAWFLOW with L.D. Consulting NV's Graphical Applications Navigator (GAN) and its integrated 5250 emulator to create an evolutionary strategy for your business application development. Indeed, the resulting applications intrinsically adopt a service-oriented architecture where every back-end business logic routine is externalized as a componentized service, readily consumable by any client environment in need of its functionality. This approach aligns your core applications with the IBM System i Developer roadmap and positions you immediately at the far end of the evolutionary cycle. With JAWFLOW, you can start today to architect and build your applications of tomorrow, where the investment you choose to make has an immediate ROI.

For more details, refer to:

http://www.ldc.be/home.htm?ldc_eng/Business%20model/busmod_JAWFLOW.htm

- JAWFLOW 2EE (Extended Java Workflow Design Framework), by L.D. Consulting NV, is an extension of JAWFLOW and makes this concept applicable within the standard J2EE concepts. It allows the reuse of i5 connector and business logic over the standardized Java Connector Architecture (JCA). This JCA integration is a two-fold enhancement, as it leverages your business logic for reuse in any JCA-enabled environment. It also allows you to integrate any business logic accessible by means of the JCA. At the front end, the framework allows you to develop interactive component-based Internet applications using JavaServer Faces. The shared platform, however, aligns a single set of technologies that share the same mind set and architecture for all your enterprise business applications whether they are rich client, intranet, extranet, or Internet solutions. JAWFLOW 2EE takes you to the next level in the IBM System i Developer Roadmap, as you can reuse your business logic to incorporate all alternative front-end technologies ranging from Web services to business process management integration with IBM WebSphere MQ Workflow. JAWFLOW 2EE standardizes the development architecture of your solutions of tomorrow without disrupting your existing applications.

  For more details, refer to:

  http://www.ldc.be/home.htm?ldc_eng/Business%20model/busmod_JAWFLOW.htm

- RPG_ILE.GEN, by L.D. Consulting nv, provides generators for the creation of RPG/ILE modules. The generators are:
  - Providers of type list, check, and validate.
  - Resolvers for insert, update, or delete databases entries.
  - Build of a virtual database.
  - Wrappers for communication with JAVA clients.
  - Make full use of dynamic storage allocations, pointers, and so on.
  - Uses external described databases as source for source coding.

  For more details, refer to:

  http://www.ldc.be/

- centric, by looksoftware, provides direct access to the presentation, application, and database layers of your applications. Broad support for interoperability allows you to rapidly integrate them with other platforms and technologies, including Java, .NET, Windows, zSeries®, and Linux.

  centric's programmatic integration support allows you to create reusable modules from your existing applications so you can benefit from Web services and service-oriented architecture (SOA).

  Use centric's flexible support for heterogeneous access and new functionality to deliver composite applications. Assemble new solutions by reusing existing components and use newlook's support for smart clients to deliver sophisticated user interfaces.

  centric can access information from multiple sources and applies your custom rules before distributing the information to the required destinations in real-time. In summary, centric provides:
  - Direct access to your 5250 and 3270 applications for presentation layer integration.
  - RPC and Web services support provides powerful application layer integration.
  - Support for IBM DDM and Microsoft's ADO lets you access databases, including DB2, SQL Server, ADO and Sybase on platforms like iSeries, zSeries, Linux, and Windows.

For more details, refer to:

http://www.looksoftware.com/prod_centric.htm

- eDeveloper, by Magic Software Enterprises, provides the most productive and rapid environment for application development and integration. eDeveloper provides a revolutionary framework for customizing and deploying complex business solutions. eDeveloper addresses the principal problems in IT management today: shortage of IT resources, the need to change dynamically with business changes, and the need for full integration with existing systems and new technologies. eDeveloper V9 provides developers with an *absolutely open* development and deployment environment with powerful new messaging and integration features, advanced XML component functionality, and support for such standards as J2EE, .NET, and Web Services.

  For more details, refer to:

  http://www.magicsoftware.com/bin/en.jsp?enPage=InnerPage&enDisplay=view&enDispWhat=object&enDispWho=tech%5El1%5EseDeveloper&enZone=tech&enVersion=0&branch=hq&enretain=branch&

- m-Power, by mrc, is Java-based and can run on almost any operating system, and access any database. It accelerates development by eliminating routine infrastructure programming, giving you ready-to-deploy n-tier Java Web applications in minutes.

  For more details, refer to:

  http://www.mrc-productivity.com/products/

- mrc-Productivity Series, by mrc, is a super set to m-Power, which means it has all of the capabilities of m-Power but is built exclusively for use with IBM @server iSeries. So, in addition to m-Power capabilities, the mrc-Productivity Series includes RPG and CGI/RPG capabilities as well.

  For more details, refer to:

  http://www.mrc-productivity.com/products/

- AX/ware Server Builder 400, by PKS Software GmbH, enables the automatic conversion of existing iSeries applications from interactive processing (with 5250 output) into batch mode. The converted (ILE) RPG/Cobol programs do not require interactive performance / interactive Commercial Processing Workload (CPW). This allows you to use low-price iSeries server models. The graphical front end is the AX/ware Universal Client. A user controlled co-existence with 5250 green screens is possible.

  For more details, refer to:

  http://www.pks.de/products/iSeries/index_iSeries.htm

- iStart Web Application Generator, by PGM Systems, Inc., simplifies Java Web development by eliminating the need to invent a methodology for managing user interaction, database access, security, and error handling. These features form the underpinnings or framework of the application and can require extensive effort to develop and maintain. iStart Web Application Generator from PGM Systems is designed to assist developers and jump start the Web application development process by generating applications and their framework.

  For more details, refer to:

  http://www.pgmsystems.com/

- Web Object Wizard (WOW), ny PlanetJ Corp., uses a Web-based development interface. Applications are created by specifying JDBC/SQL operations and configuring application metadata. Clients can easily access and manipulate data stored in any relational database, including DB2, Oracle, and SQL Server. Applications execute within WebSphere, WebLogic, or Tomcat application servers.

For more details, refer to:

http://www.planetjavainc.com/products.htm

- PSC/400 Advanced Edition, by Pluta Brothers Design, Inc., is designed by and for midrange programmers, not Web gurus. PSC/400 was designed around business requirements, not just the latest technology buzzwords. After reviewing the options available for Web enabling existing applications, they decided that none fit the requirements of existing iSeries shops. They either required programmers to learn new skills, or needed big, clunky PC-based tools, or simply did not create usable interfaces.

  PSC/400 is the only tool that can completely convert your applications to run on the Web without a PC, without retraining, and without an interactive workload.

  For more details, refer to:

  http://www.plutabrothers.com/PBDWeb/p1.html

- RPG Server Pages (RSP), by ProData Computer Services, Inc., is the latest in the evolution of RPG. By integrating HTML directly with RPG, developers are able to create Web applications visually. This concept is similar to JSP and Active Server Pages (ASP), except RPG is the controlling language.

  Features at a glance:

  – Combine the efficiency of RPG with the flexibility of the Internet.
  – Leverage the existing RPG skills of your programmers.
  – Embed HTML and Java Script into the RPG code, allowing for faster development.
  – Use a graphical IDE for rapid development.
  – Get up and running fast. Publish Web pages within hours of installing RSP.

  For more details, refer to:

  http://www.prodatacomputer.com/

- Stored Procedure Test Environment (STE), by ProData Computer Services, Inc., helps developers often faced with a large number of input parameters with no way to see the result set. In the past, this has made testing and debugging stored procedures difficult. STE makes the developer's task of testing stored procedures worry free.

  Features at a glance:

  – Prompts the user for the required input parameters.
  – Displays the result sets that were generated.
  – Display the output parameters that were returned for the stored procedure.
  – Printing the results is also available.

  For more details, refer to:

  http://www.prodatacomputer.com/

- RPG Smart Pages (RPGsp), by Profound Logic Software, enhances RPG to be a powerful Web development language. It is the first and only iSeries Browser Applications Development Environment based on native RPG. With RPGsp, developers can quickly create robust Web or intranet applications by embedding iSeries RPG business logic directly into HTML content. With the free download trial of RPG Smart Pages (RPGsp), you can start creating Web browser applications in minutes!

  For more details, refer to:

  http://www.profoundlogic.com

- Websydian Product Suite, by Soft Design A/S, contains the e-business development tools Web Developer, Web-Shop Developer, Wireless Developer, TransacXML Developer, and Portal Developer, plus Websydian Express, an out-of- the-box Web solution.

  Websydian Web Developer provides Websydian Express, an out-of-the box Web solution, complete with user management and enterprise security model. It further includes additional patterns that are abstract solutions for typical data manipulation scenarios, with complete separation between application appearance and functionality. Websydian Web Developer allows development of J2EE applications.

  Websydian TransacXML Developer is a complete Web services application development environment, which enables corporate developers to build transactional XML applications quickly, reliably, and tightly integrated with corporate back-end systems and processes. Web service development using Web Services Description Language (WSDL) and based on the Simple Object Access Protocol (SOAP) standard is easy with TransacXML and requires no knowledge of XML.

  The Websydian Server supports the operational environment for the Distributed Websydian Architecture, including J2EE, continuously monitoring the application, performing error recovery, and enabling automatic start and stop of application services without disrupting the e-business operation.

  For more details, refer to:

  http://www.websydian.com/websydiannet/app

- Delphi/400, by SystemObjects Corp., is an IDE using PASCAL to build Internet Server Application Programming Interface (ISAPI) dynamic language libraries (DLLs) or create ActiveX® components to build your Internet applications. It can also be used to build rapidly and easily client/server applications accessing natively your physical and logical files. There is no Object Database Connectivity (ODBC) driver; you just need a Transmission Control Protocol/ Internet Protocol (TCP/IP) connection (commonly used today) or an Advanced Program to Program Communications (APPC) router.

  For more details, refer to:

  http://www.systemobjects.com/HomeDelphi400.html

- JACi400, by SystemObjects Corp., is a complete solution to give all System i users access to all applications using only Microsoft Internet Explorer, a thin client:
  - All existing 5250 applications are converted to HTML.
  - All new ones are developed directly in HTML using your existing knowledge in RPG or COBOL.
  - You can mix both types of applications, converted and developed, in order to minimize the time and the effort to open your system to all Internet, extranet, or intranet users
  - Now you can use these applications with IBM WebSphere Portal.

  JACi400 is based on four modules:

  - JACi400 Conversion: To transform 5250 applications in HTML.
  - JACi400 Development: To develop new HTML applications without any 5250 limits directly in RPG or Cobol.
  - JACi400 Deployment: The runtime that works with WebSphere Application Server.
  - JACi400 Portlet: An IBM WebSphere Portal Portlet that uses all converted or developed applications directly inside the portal.

  Using IBM WebSphere Portal is a 100% secured solution to open i5 applications to the Web; IP addresses, user IDs, and passwords of the i5 are not used by the Internet user.

For more details, refer to:

http://www.systemobjects.com/HomeJACi400.html

3.4 Tools to enhance the end-user experience

The System i Developer Roadmap defines the *Enhance the end-user experience* step as taking the application presentation to the next level with browser, client-server, and pervasive technologies.

- Application refacing: Tools to put a graphical front end on existing 5250 applications (rich or browser GUI) with little or no programmer intervention.
- Application servers: Runtime environments and management tools for J2EE and Web service based applications
- Domino servers: Server components of Lotus Domino Family of integrated messaging, collaboration, and Web application software.
- Online analytical processing: Tools that perform analytical processing over historical data.
- Portal and personalization: Tools for setting up Web portal interfaces and creating personalized user interfaces.
- Query/report writing: Tools that are used by end users and analysts to present the results of queries into the historical data either for display or print.
- Report and data delivery: Tools for retrieving, managing, mailing, distributing, importing, and using printed data for iSeries jobs.

The following subcategories contain ISV tools that apply directly to application modernization:

- Application refacing
- Portal and personalization

3.4.1 Application refacing

This subcategory includes tools to put a graphical front end, either a rich or browser graphical user interface (GUI), on an existing 5250 application. A key aspect of application refacing is to minimize the amount of programmer intervention required to put this graphical front end on the application. The ISVs tools included in this subcategory, in alphabetical order and by company name:

- GUIStyle, by ADVANCED BusinessLink Corp., is the latest addition to the revolutionary suite of technologies to help clients compete in the dynamic Internet marketplace. For years, firms have used different vendors tools and approaches to graphically enhance existing applications. The results have been varied, and certainly no ideal answer had been found. GUIStyle attempts to change that by offering a fresh new perspective through the use of Styles to solve the existing rejuvenation challenge.

  In the process, we set lofty design objectives geared towards addressing the areas so many have struggled within the past, and the result has been another breakthrough technology from Advanced BusinessLink. GUIStyle's success at reaching these design objectives resulted in high performance with a small applet and sub-second response time, elimination of source code requirements, elimination of screen by screen design task, elimination of ongoing maintenance as application grows, a highly polished interface flexibility, and a path beyond the 5250 model.

  For more details, refer to:

  http://www.businesslink.com/product/strategi/guistyle/homepage.htm

- HostFuse, by Jacada, provides for real-time, non-intrusive integration of existing applications that enables companies to easily develop, deploy, and maintain access to their existing systems and data. The product's point-n-click graphical modelling interface and comprehensive list of application program interfaces (APIs) empower developers to create modern client/server applications and Web-based solutions using their existing host data, without re-engineering those host applications.

  For more details, refer to:

  http://www.jacada.com/products/hostfuse/

- GAN/i5 (Graphical Application Navigator), by L.D. Consulting NV, is an unique graphical applications navigator for the iSeries.mySeries. It is created with and based on the JAVA Workflow manager framework (JAWFLOW). GAN/i5 uses no middleware or other software than Java Virtual Machine (JVM) and software delivered with i5/OS. A Java based 5250 emulator is included. GAN/i5 is a low cost add-on giving iSeries an opening into the graphical world in combination with full server consolidation.

  For more details, refer to:

  http://www.ldc.be/

- newlook, by looksoftware, provides productive user interface management and refacing existing applications, and is a common first step on the road to a complete modernization solution. newlook's rules-based repository allows customized UI generation to suit your existing applications. Focus on the key parts of your application and redesign those UIs; leave the rest to newlook's instant UI generation. The dynamic rules-based approach is the fastest and easiest way to provide modern UIs for your existing applications.

  All newlook UI functionality can be deployed simply and quickly for browser and smart client environments. Optional integrated 5250 emulation support, secure 5250 Web-to-host connectivity, and customized graphical UIs for internal users, business partners, and clients gives you the deployment power you need.

  Take your applications forward with newlook's support for smart client interfaces. There is no need for 5250 or 3270 data streams or even interactive sessions. Use newlook's comprehensive set of UI controls including DataGrid, Tree View, and many more sophisticated features. Consume Web services or connect directly to server-based application logic, including RPG, COBOL, or Java. Connect directly to DB2 and other databases, like SQL Server, Oracle, and Access.

  For more details, refer to:

  http://www.looksoftware.com/prod_newlook.htm

- AX/ware Universal Client, by PKS Software GmbH, generates an attractive, open, and platform-independent GUI without the limits of 5250 data stream. Existing iSeries DDS are transformed to generate a User Interface Object model that can be presented on Windows desktops (Win-Client) and Web-browsers (Web-Client), or the created XML data stream can be used for your own development.

  For more details, refer to:

  http://www.pks.de/products/iSeries/index_iSeries.htm

- PSC/400 Advanced Edition, by Pluta Brothers Design, Inc., is designed by and for midrange programmers, not Web gurus. PSC/400 was designed around business requirements, not just the latest technology buzzwords. After reviewing the options available for Web enabling existing applications, they decided that none fit the requirements of existing iSeries shops. They either required programmers to learn new skills, or needed big, clunky PC-based tools, or simply did not create usable interfaces.

  PSC/400 is the only tool that can completely convert your applications to run on the Web without a PC, without retraining, and without an interactive workload.

For more details, refer to:

http://www.plutabrothers.com/PBDWeb/p1.html

- BlueZone Terminal Emulation, by Seagull Software Systems, Inc., is next-generation terminal emulation technology that is easy to implement, easy to use, and delivers immediate cost savings. In fact, companies that replace first-generation emulators with BlueZone can cut their total cost of ownership by 50 to 80 percent.

  BlueZone capabilities:

  - Supports Web and desktop emulation, plus FTP connectivity, all in one product.
  - Delivers powerful automated macro and script conversion capabilities for easy replacement of out-dated emulator technologies.
  - Upgrades are included in your annual maintenance subscription, there are no hidden fees.
  - Centralized distribution frees up help desk resources and makes users more productive.
  - Licensing that best suits your needs, whether concurrent or per seat, at no additional charge.
  - Utilizes the convenience of a Web browser for automatic, easy, and risk-free installation, configuration, and updates.
  - Supports Secure Sockets Layer (SSL) encrypted connectivity right out of the box, ensuring the highest levels of security and code integrity.
  - Includes BlueZone SecureFTP, which provides SSL connectivity to any SSL-capable FTP server, including iSeries, V5R1, z/OS®, and z/VM.

  For more details, refer to:

  http://www.seagullsoftware.com/products/bluezone_terminal.html

- J Walk (a LegaSuite solution), by Seagull Software Systems Inc., is the industry-leading presentation integration technology for iSeries applications. The solution provides developer tools, server software, and client deployment technology that enables you to build intuitive, graphical clients for existing iSeries applications. The applications can then be deployed in Windows, Java, or HTML environments, all with just one development effort.

  With J Walk, you can customize screens and re-engineer workflows quickly to match business processes and improve usability. J Walk takes advantage of industry standard interfaces, such as XML, J2EE, and SOAP, enabling you to integrate your new GUI client with desktop and Web applications, portals, and Web services. The J Walk solution is a rapid-deployment, non-invasive approach that requires no complex coding or duplicate business logic, so you get a quick return on your investment without the risk.

  Using J Walk, organizations can:

  - Re-engineer workflows, collapsing the number of steps to perform a business process.
  - Automate and accelerate business processes, allowing users to select data from drop-down menus, radio buttons, and combo boxes instead of manually looking up commands and codes.
  - Provide secure access to iSeries applications via the Internet, a portal, or wireless devices.
  - Offer 24x7 Web self-service to clients, employees, and business partners.
  - Integrate iSeries applications with other systems.
  - Invoke Web services through the J Walk client.

For more details, refer to:

http://www.seagullsoftware.com/products/

- Quickstep:2e, by Systems Advisory Services Ltd., provides the ability to automatically generate a feature rich, Windows style GUI for your iSeries software, created in All Fusion 2E. Quickstep:2e runs as a completely transparent development step after the generation of your program. Utilizing information from the display files and the 2E model, Quickstep:2e automatically generates Java-based GUIs for each of your green screen displays. Quickstep:2e slightly modifies your 2E generated source code to facilitate communication with the Java display code, which runs on the client terminal.

  Quickstep:2e adds GUI functions to your programs and removes nothing. The modified programs can still be run via a green screen. In fact, any combination of GUI displays and green screens can be used simultaneously.

  In addition to being effortless, GUI sessions run as batch jobs, so they use zero interactive capacity. Think of the cost savings. In fact, the savings in the cost of interactive machine capacity, or of the IBM new Enterprise Package, are likely to more than pay for Quickstep:2e. You will probably get the GUI for nothing.

  Quickstep:2e includes a secure and user friendly integrated menu system, with full support of all 5250 functionality, including function keys and the inset keypad, standard Windows features such as cut and paste, automatic prompting, the ability to load and scroll through multiple pages of subfile records on a single display, and much more.

  While Quickstep:2e produces excellent GUI displays automatically, it also allows great scope for customization. Add corporate logos and product graphics, alter colors and fonts, add links to Excel®, and much else besides.

  For more details, refer to:

  http://www.quickstep.net.nz/index.html

- JACi400, by SystemObjects Corp., is a complete solution to give all System i users access to all applications using only Microsoft Internet Explorer, a thin client:
  - All existing 5250 applications are converted into HTML.
  - All new ones are developed directly in HTML using your existing knowledge in RPG or COBOL.
  - You can mix both types of applications, converted and developed, in order to minimize the time and the effort to open your system to all Internet, extranet or intranet users.
  - And now you can use these applications with IBM WebSphere Portal.

  JACi400 is based on four modules:
  - JACi400 Conversion: To transform 5250 applications in HTML.
  - JACi400 Development: To develop new HTML applications without any 5250 limits directly in RPG or COBOL.
  - JACi400 Deployment: The runtime that works with WebSphere Application Server.
  - JACi400 Portlet: An IBM WebSphere Portal Portlet that uses all converted or developed applications directly inside the portal.

  Using IBM WebSphere Portal is a 100% secured solution to open i5 applications to the Web; IP addresses, user IDs, and passwords of the i5 are not used by the Internet user.

  For more details, refer to:

  http://www.systemobjects.com/HomeJACi400.html

- Convertigo 3.2 SP4, by TWinSoft, allows access to existing applications in a non-intrusive way, with no modifications to the existing applications, by using their existing exposed interfaces, such as 3270/5250/VT/DKU user screen interfaces or IBM CICS® COMMAREA.

  Convertigo is composed of three editions to address all integration needs:

  - Convertigo publishing edition: To build intranets or extranets from existing applications or to integrate them in enterprise portals (Webization).
  - Convertigo mobile edition: To access existing applications through mobile devices, such as PDAs, smart phones, or mobile PCs.
  - Convertigo connector edition: To integrate existing applications in new SOA based information systems by using the SOAP Web service technology.

  For more details, refer to:

  http://www.twinsoft.fr/intl/en/cariocaweb/convertigo_present.htm

3.4.2 Portal and personalization

The tools in the portal and personalization subcategory are used to create and set up Web portal interfaces and create personalized user interfaces. The ISVs tools in this subcategory are:

- Bowstreet Portlet Factory for WebSphere, by Bowstreet Inc., eliminates the complexity of creating even simple portlets and makes it easy for even new J2EE developers to rapidly create, maintain, and deploy flexible portlets. In addition, the Portlet Factory enables companies to:

  - Increase developer productivity up to 12x by enabling rapid iteration during development and testing of portlets.
  - Develop, test, debug, run, and modify portlets as fully functioning, stand-alone Web applications outside of the portal framework.
  - Effortlessly deploy new portlets without needing to create (or even comprehend) deployment descriptors, JARs, or WAR files.
  - Dramatically simplify maintenance. Changes are instantly propagated to deployed or staged portlets without any additional effort.
  - Reduce cost and cycle time by automating tasks that developers typically perform repetitively by hand.

  For more details, refer to:

  http://www.bowstreet.com/products/portletfactory/websphere.html

- Nexus Portal, by Business Computer Design, is a comprehensive and complete portal solution that gives organizations control of what specific applications and programs they want individuals and groups to access from the Web. It also provides users with the productivity tools they desire to customize and better manage their work environment, all in a familiar Web browser interface.

  Nexus Portal allows you to create and configure multiple Nexus Portal instances (called Sites) all running off the same iSeries server and the same copy of the Nexus Portal software. The site administrator can create and design site-wide pages, accessible by all site members. Group administrators can create and design pages accessible by all members of their group. Users can create their own Nexus Portal home pages, or use the portal default. Portal pages can be frames-based, with navigation menu on left and content on right, or can be portlet-based. Portlets (distinct areas of the portal page design) can be placed anywhere on a page. The flexible user interface allows drop-down menus

for portal, group, or user pages. Users can customize their own pages. Group administrators can customize pages for all members of their groups. Site administrators can customize pages for all site members. Schemes are modifiable and extensible, so you can use your corporate logos and colors. It includes Enterprise Content Manager (Nexus ECM) for secured storage and retrieval of reports via browser. Interfaces with Catapult® for automated archiving of spool files.

For more details, refer to:

http://www.bcdsoftware.com/wow.htm#nexus

- GAN/i5 (Graphical Application Navigator), by L.D. Consulting NV, is an unique graphical applications navigator for theiSeries.mySeries. It is created with and based on the Java Workflow manager framework (JAWFLOW). GAN/i5 uses no middleware or other software than Java Virtual Machine and software delivered with i5/OS. A Java-based 5250 emulator is included. GAN/i5 is a low cost add-on giving an iSeries server an opening into the graphical world in combination with full server consolidation.

  For more details, refer to:

  http://www.ldc.be/

- JACi400, by SystemObjects Corp., is a complete solution to give all System i users access to all applications using only Microsoft Internet Explorer, a thin client:
  - All existing 5250 applications are converted to HTML.
  - All new ones are developed directly in HTML using your existing knowledge in RPG or COBOL.
  - You can mix both types of applications, converted and developed, in order to minimize the time and the effort to open your system to all Internet, extranet, or intranet users.
  - And now you can use these applications with IBM WebSphere Portal.

  JACi400 is based on four modules:
  - JACi400 Conversion: To transform 5250 applications in HTML.
  - JACi400 Development: To develop new HTML applications without any 5250 limits directly in RPG or COBOL.
  - JACi400 Deployment: The runtime that works with WebSphere Application Server.
  - JACi400 Portlet: An IBM WebSphere Portal Portlet that uses all converted or developed applications directly inside the portal.

  Using IBM WebSphere Portal is a 100% secured solution to open i5 applications to the Web; IP addresses, user IDs, and passwords of the i5 are not used by the Internet user.

  For more details, refer to:

  http://www.systemobjects.com/HomeJACi400.html

3.5 Tools to create a modular architecture

The System i Developer Roadmap describes the *Create a modular architecture* step as the separation of user presentation, business logic, and database access, thereby creating reusable application and database callable modules. All the subcategories in this step relate to application modernization and integration:

- Business rule logic extraction for service-oriented architecture (SOA): Tools to extract business rule logic from existing interactive RPG/COBOL into new components for deployment in SOA environments.

- Client integration: Tools for connecting client systems to iSeries and connecting client applications.
- .Net integration: Tools that provide integration between iSeries and .Net applications.
- Regenerate RPG into J2EE: Tools to convert 5250 display files into Java Server Facing (JSF) or JavaServer Pages™ (JSP) and converts RPG input output into Java SQL. Also included are tools that convert or transform RPG to Java.
- RPG to Java conversion: Tools to convert RPG code to Java code.
- SOA Framework Tools: Tools that provide a framework used to create and maintain modular applications with full separation of business logic, database, and presentation layers. The tools are also capable of creating Web services.

3.5.1 Business rule logic extraction for SOA

This subcategory includes tools to extract business rule logic from existing interactive RPG/COBOL programs and turn this logic into new components for deployment in SOA environments. The details on the ISVs tools included in this subcategory are found in “Business rule logic extraction for SOA tools” on page 99.

3.5.2 Client integration

The client integration subcategory consists of tools for connecting client systems to iSeries and connecting client applications. The ISVs with tools in this subcategory are (in order by company name):

- Excel-erator, by Gumbo Software, Inc., is an i5/OS (OS/400) based software utility that converts database files into spreadsheets in Microsoft's Excel format. The resulting PC files are either placed into a directory in i5/OS's IFS or sent as an e-mail attachment. With Excel-erator, you can make data available to your users in the form best suited to them.

  Excel-erator is packaged as a licensed program and participates in the full range of support provided by i5/OS. Licensed program installation, PTF management, and so on, are handled with the same commands used to manage IBM software.

  For more details, refer to:

  http://www.smisupervisor.com/

- Robot/CLIENT, by Help/Systems, Inc., is a client event manager that integrates PCs and UNIX servers into iSeries procedures. Robot/CLIENT provides the two-way communication necessary for server automation. Use Robot/CLIENT to initiate Windows or UNIX tasks from iSeries programs and receive a completion status; monitor critical client applications or services; e-mail your clients; and manage client upgrades from a central location. Robot/CLIENT allows client systems to:
  - Pass status information to the AS/400.
  - Send pager messages using Robot/ALERT.
  - Send job completion statuses to Robot/SCHEDULE.
  - Trigger a reactive job.
  - Send a message to any AS/400 message queue.
  - Back up attached client systems with Robot/SAVE.

  For more details, refer to:

  http://www.helpsystems.com/products/client.html

- XBoffice, by INVENSO, integrates with Microsoft Office and creates professional documents, handling spreadsheet data in two ways. It has the following features:
  - An easy to use template designer.
  - Support for the formats PDF, RTF, HTML, XML, TXT, and so on.
  - Direct or delayed printing to any network printer.
  - Multiple bin support.
  - Easy integration with existing FAX applications like FAXSTAR.
  - E-mail support.
  - Support for Visual Basic Applications (VBA) and macros.
  - Trace, log, and flow control features.
  - Suitable for high volume multi process transactions.
  - Official Microsoft certified product.
  - Worldwide client base.

  For Word 2003:
  - Fully compliant with all features within Word2003.
  - Additional support to save results in native WORD format.
  - Results can be opened in most of the Office products like Open Office, Star Office, and older Microsoft office suites.
  - Ability to open the generated document on the client PC in front of the requesting 5250 or GUI application.

  For Excel 2003:
  - Support all EXCEL formats.
  - Convert selected cells to XML or visa versa.
  - Configurable polling feature to detect and handle incoming spreadsheet documents.
  - Error detection based upon schema technology with “move on error” and message features.
  - Calculation and formula support.

  For more details, refer to:

  http://www.invenso.com/
- OctoTools, by JBM Systems, Inc., is a document management tool that encompasses Forms Design, Report Formatting, Electronic Distribution, Printing, and Text to PDF conversion. Once set up, OctoTools runs automatically to provide high volume throughput without operator involvement. OctoTools is composed of two main modules: OctoDesigner and OctoToolsRTE (Run Time Engine).

  For more details, refer to:

  http://www.jbmsystems.com/octotools.html/
- LANSA Client, by LANSA, gives end users GUI access to enterprise data on Windows, iSeries, AS/400, UNIX, and Linux servers. You can report, chart, and query from a single tool with unparalleled ease-of-use. You can also copy data to popular spreadsheets or other PC tools for analysis. You can dramatically reduce the application backlog by empowering end users to create their own reports. You can even publish reports to Internet Web sites.

For more details, refer to:

http://www.lansa.com/products/clientoverview.htm

- LANSA Integrator, by LANSA, enables integration of Application-to-Application (A2A) and Business-to-Business (B2B) transactions through XML and Java services. LANSA Integrator allows bi-directional XML — and other data formats — to be exchanged between you and your trading partners, regardless of platform. It also enables integration of user-written Java services with LANSA, C, RPG and COBOL applications.

  What can LANSA Integrator do?

  - Automate orders between a manufacturer and distributor by dynamically linking ERP systems.
  - Exchange information between ATMs and server-based banking systems.
  - Integrate a Java-based credit card application with an order entry system.
  - Send and receive XML transactions between suppliers and distributors.
  - Exchange data between a stand-alone wireless device and the server.
  - Publish or utilize third-party Web services via SOAP.
  - Provide SOAP interfaces to your existing business functions.
  - Integrate heterogeneous CRM and back-office systems via XML over MQ Series.
  - Provide secure (digital certificates and password protected) PDF documents via e-mail for contract agreements.
  - SMS updates on the status of order or delivery transactions in real time.
  - And many more practical applications.

  For more details, refer to:

  http://www.lansa.com/products/integratoroverview.htm

- Direct Data Access (DDA)/400, by RJS Software Systems, Inc., is a unique AS/400 data access solution that allows developers to create Visual Basic, Powerbuilder, or Delphi applications that can directly access AS/400 database files. Using DDA/400 and the included CoreCode VB/Delphi database code generation tool, your first application can be developed within minutes of installation.

  To utilize the DDA/400 CoreCode code generation tool, developers select the files they wish to work with and let CoreCode generate all the necessary Visual Basic or Delphi database access code for the application, including all AS/400 field definitions. By letting DDA/400 generate the necessary database access code, the developer can continue to concentrate on the user interface, which is where Visual Basic and Delphi excel.

  For more details, refer to:

  http://www.rjssoftware.com/

- iSeries Office Integrator, By RJS Software Systems, Inc., is the answer to the need for integrating AS/400 or iSeries applications and data with PC applications. The iSeries Office Integrator replaces OfficeVision/400™ by creating letters and mail merges using live AS/400-iSeries data and Microsoft Word.

  Highlights:

  - Replaces OfficeVision/400 word processing tasks with MS Word and live iSeries data.
  - MS Word mail merges can be initiated from any AS/400 interactive or batch CL, RPG, or COBOL program to provide mail merge processing automation and printing.
  - New Word documents can be created from Word templates and text can be inserted from an iSeries interactive program on the fly.

- Existing Word documents can be opened for processing.
- iSeries database queries can be run and the results can be transferred directly to a user's PC desktop folder or a remote FTP location.
- Any PC program can be called from the iSeries. This is a nice way to create seamless integration between AS/400 - iSeries applications and PC programs. It is also a great way to launch scheduled jobs on the PC.
- New e-mail messages can be created via any MAPI mail client, such as Outlook®, Outlook Express, Lotus Notes®, and so on.

For more details, refer to:

http://www.rjssoftware.com/

- iSeries Complete OS/400 Solution, by RJS Software Systems, Inc., is a comprehensive iSeries bundle that gives you access to all existing RJS-developed iSeries based software utilities and middleware, plus any that are developed and released in the future. Today, that includes our OS/400-based Report and Data Delivery, Document and Image Management, and productivity and Development Tools. As long as you remain current with your maintenance, all new OS/400-based software utilities will be available to you at no additional cost other than the royalty or hardware costs RJS incurs.

  For more details, refer to:

  http://www.rjssoftware.com/

- WinSpool/400 Report Converters, by RJS Software Systems, Inc., has four different WinSpool report conversion products. They include the following:
  - *WinSpool/400 HTML Report Converter* converts downloaded AS/400 reports to the popular HTML Web browser document format. This can be done manually or automatically and can be viewed or integrated with other applications.
  - *WinSpool/400 PDF Report Converter* converts downloaded AS/400 reports to the popular Adobe Acrobat PDF document format.
  - *WinSpool/400 PostScript to PDF Converter* is a plug-in for the WinSpool/400 product line. It is used to automatically convert PostScript reports to PDF for electronic delivery or archival.
  - *WinSpool/400 RTF Report Converter* converts downloaded AS/400 reports to the popular RTF word processing document format.

  For more details, refer to:

  http://www.rjssoftware.com/

- WinSpool/400, by RJS Software Systems, Inc., is a Microsoft Windows, PC software application used to interactively download AS/400 reports for use with PC data analysis software programs, such as Monarch, DataImport, Microsoft Excel, Access, Foxpro, Lotus 123, Crystal Reports, and other PC software applications and report writer programs.

  Highlights:
  - Utilizes AS/400 spool file security to keep users out of unauthorized spool files.
  - Reports can be converted to ASCII text, HTML, RTF, or PDF files.
  - Reports can also be converted to spreadsheet and database formats.
  - Compatible with Monarch spool parsing software.
  - Easy to use Microsoft Windows interface.
  - Point and click spool file selection.
  - AS/400 print control characters can be included in a downloaded spool file.

- Spool files can have automatic names assigned when downloading.

  For more details, refer to:

  http://www.rjssoftware.com/

- Compleo Explorer, by Symtrax, lets users access iSeries print queues and spool files. Users can download spool files to PC applications and formats like spreadsheets, word processors, and e-mail. CE can also be used to archive spool files to CD-ROM and PC networks. CE is a 100% secure solution, and comes with its own security to limit access to iSeries queues and spool files. It can be100% automated with the Compleo Supervisor product.

  For more details, refer to:

  http://www.starquery.com/en/products/compleo/default.asp

- Delphi/400, by SystemObjects Corp., is an IDE using PASCAL to build ISAPI DLLs or create ActiveX components to build your Internet applications. It can also be used to build rapidly and easily client/server applications accessing natively your physical and logical files. There is no ODBC driver. You just need a TCP/IP connection (Commonly used today) or an APPC router.

  For more details, refer to:

  http://www.systemobjects.com/HomeDelphi400.html

3.5.3 .NET integration

The tools in this subcategory enable integration between System i platform and .Net applications. For details on the ISVs tools in this subcategory, see 5.3.1, “IBM ServerProven ISV tools for integration” on page 77.

3.5.4 Regenerate RPG into J2EE

The tools to regenerate RPG into J2EE convert 5250 display files into JSF or JSP and RPG input output (IO) into Java SQL. This subcategory also includes tools that convert or transform RPG to Java. The tools are (listed in order by company name):

- X-Analysis, by Databorough, is a full cycle development tool kit, and world leader in iSeries application retro-documentation. It will extract business rules from your RPG/LE, with a full data model, move you to Java, and supply you with a Web deployable UI. It will also give you complete and instant graphical documentation of what the application is supposed to do, and supply you with a full test environment with data rollback ability, and is done programmatically. Whether you just want to document your entire system from the early 80s, or deploy that same product on the next generation of IBM servers, X-Analysis is the tool kit that you need. It has the following features:
  - Reverse engineers data models.
  - RPG/COBOL/JAVA cross-referenced together.
  - Views RPG as pseudo code.
  - Documents business rule logic.
  - Generates business rule server programs from existing code.
  - Reverse engineers JSP/JSF/ASP Web UI from existing programs.
  - Converts existing I/O into Java/SQL.
  - Integrated data analysis.
  - Documents your entire system instantly and automatically.

- Plugs into WDSC with new Web projects from converted components.
- Integrated data analysis.
- Exports to XMI, DDL, Microsoft Word, and Visio.

For more details, refer to:

http://www.databorough.com/

- 2WEB/400 Toolkit, by Monitin Information Systems, Ltd., rapidly migrates AS/400 RPG/COBOL (green screen) systems to the iSeries Web environment, with minimum programming demands. 2Web/400 completely protects enterprise investment in existing RPG/COBOL programs by automatically converting Display Files functions to external Java objects. 2Web/400 automatically generates Program Call Markup Language (PCML), RPG Beans, XML, JSP, and HTML under WebSphere Application Server, to allow for full Internet/intranet operation, while retaining existing RPG/COBOL business logic and enabling full connectivity to the new Java GUI objects. 2Web/400 enables safe migration of large AS/400 (green screen) applications to new 3-layer Internet applications, based on System i or WebSphere Application Server environments. The 2Web/400 migration process preserves existing business logic in the new Java Browser, and three layer architecture under IBM WebSphere environment, providing easy maintenance of one integrated system. Monitin 2Web/400 migration enables enterprises to rapidly and safely migrate to IBM @server iSeries environment, creating an integrated three layer browser solution with minimum programming, testing, and implementation investment.

  The toolkit consists of the following tools:

  - 2WEB400 MonScript
  - 2WEB400 PCML Tube
  - 2WEB400 JCX
  - 2WEB400 CR2JAV
  - 2WEB400 TransD

  For more details, refer to:

  http://monitin-ltd.com/

3.5.5 RPG to Java conversion

The tools in this subcategory convert RPG to Java. The tools in this subcategory are:

- RPG into Objects (RIO), by Advanced Systems Concepts, is a conversion tool for the AS/400 or iSeries that automatically converts RPG into C++ programs or Java classes. It allows you to more easily enable your existing applications for .Net, WebSphere development, e-business, or the latest technologies or programming techniques.

  RIO is the only product of its kind for the iSeries. It translates your RPG application into today's most robust OO languages and provides a JSP or XSL front end for the new applications. The end result is a new application that can be redeployed on the iSeries or used on virtually any other platform!

  RIO generates normal Java classes and C++ programs, plain and simple. Unlike other tools or approaches, you are not required to use a proprietary 4GL or development tool to maintain the code. Programmers are free to use whatever development tools or environment they prefer. RIO also includes Java and C++ templates that mimic functions that exist in RPG but are not provided in Java or C++.

  RIO is extremely easy to use. Tell it what to convert and what type of program output you want, and it is all done automatically. You will save countless hours on your conversion project. There is no comparison between using RIO and any other approach. RIO is the

fastest, easiest and most straightforward way to convert your RPG applications into C++ or Java.

For more details, refer to:

http://www.asc-iseries.com/rio/index.htm

- Jenasys, by Mincron SBC Corporation, translates RPG into Java, enabling rapid Web deployment on any platform supporting Java. In addition:
  - Jenasys preserves all business logic embedded in your RPG.
  - Jenasys offers complete control over display design.
  - New translated code is left in an “RPG” format.
  - Enables Web services development utilizing XML.
  - 100% J2EE compliant.

  For more details, refer to:

  http://www.mincron.com/jenasys/jenasys.shtml
- mrc-Productivity Series, by mrc, is a super-set to m-Power, which means it has all of the capabilities of m-Power but is built exclusively for use with IBM @server iSeries. So, in addition to m-Power capabilities, the mrc-Productivity Series includes RPG and CGI/RPG capabilities as well.

  For more details, refer to:

  http://www.mrc-productivity.com/products/
- Caravel, by Transtools, Inc., translates 100% of the RPG/Cobol systems running on OS/400 to Java, with the advantages of this standard: graphic interfaces, object-oriented programming, multi-platform, Web applications, and e-business components. Systems are translated while keeping the same functionality as the original programs, without the need for expensive user training or for the organization using them having to modify its procedures.

  For more details, refer to:

  http://www.transtools.com/products/en/caravel1.htm/

3.5.6 SOA framework tools

The SOA framework tools provide a framework used to create and maintain modular applications characterized with full separation of business logic, database, and presentation layers. Many of these tools are also capable of creating Web services. The details on the ISVs tools in this subcategory are in “SOA framework tools” on page 100.

3.6 Tools to integrate applications

The System i Developer Roadmap defines *Integrate applications* as adopting new technologies, optimizing access to applications and business logic and integrating applications maximizing reuse. The subcategories in this step are:

- Bar code/Forms/RFID: Tools that print barcode or radio frequency identification (RFID) labels and special forms that may include bar code or RFID.
- Connectivity: Tools that aid in the connectivity of unlike systems.
- Data movement and migration: Tools that are used to select and copy data from one system to another, typically to consolidate data from unlike data sources.
- EAI/Application integration: Tools that aid in integration of enterprise applications.

- Extract/Transform/Load: Data warehouse extraction, transformation, or load tools for changing the format, or cleansing and loading of source data for a data warehouse.
- Mail and messaging: Tools that enable the exchange of mail and messages between e-mail systems.
- Payment servers: Tools for interfacing with credit card and other payment processing services.
- Wireless: Tools that enable wireless solutions.

The subcategories that apply directly to modernization and integration are:

- Connectivity
- EAI/Application integration

3.6.1 Connectivity

This subcategory includes tools that aid in the connectivity of unlike systems. The ISVs tools included in this subcategory are (in alphabetical order by Company name):

- Robot/CLIENT, by Help/Systems, Inc., is a client event manager that integrates PCs and UNIX servers into iSeries procedures. Robot/CLIENT provides the two-way communication necessary for server automation. Use Robot/CLIENT to initiate Windows or UNIX tasks from iSeries programs and receive a completion status; monitor critical client applications or services; e-mail your clients; and manage client upgrades from a central location. Robot/CLIENT allows client systems to:
  - Pass status information to the AS/400
  - Send pager messages using Robot/ALERT
  - Send job completion statuses to Robot/SCHEDULE
  - Trigger a reactive job
  - Send a message to any AS/400 message queue
  - Back up attached client systems with Robot/SAVE

  For more details, refer to:

  `http://www.helpsystems.com/products/client.html`
- LANSA Integrator, by LANSA, enables integration of Application-to-Application (A2A) and Business-to-Business (B2B) transactions through XML and Java services. LANSA Integrator allows bi-directional XML — and other data formats — to be exchanged between you and your trading partners, regardless of platform. It also enables integration of user-written Java services with LANSA, C, RPG, and COBOL applications.

  LANSA Integrator can:
  - Automate orders between a manufacturer and distributor by dynamically linking ERP systems.
  - Exchange information between ATMs and server-based banking systems.
  - Integrate a Java-based credit card application with an order entry system.
  - Send and receive XML transactions between suppliers and distributors.
  - Exchange data between a stand-alone Wireless device and the server.
  - Publish or utilize third-party Web services via SOAP.
  - Provide SOAP interfaces to your existing business functions.
  - Integrate heterogeneous CRM and back-office systems via XML over MQ Series.

- Provide secure (digital certificates and password protected) PDF documents via e-mail for contract agreements.
- SMS updates on the status of order or delivery transactions in real-time.
- And many more practical applications.

For more details, refer to:

http://www.lansa.com/products/integratoroverview.htm

- Transfer Anywhere, by Linoma Software, is an enterprise-level solution for retrieving, converting, compressing, encrypting, signing, and distributing data and files. This multi-purpose product not only allows you to easily share data within your organization, but can also be used to effortlessly exchange data with your trading partners. Capabilities include:
  - Install using a straightforward installation wizard.
  - Describe and reuse data sources and distribution lists.
  - Define and execute transfer definitions using intuitive graphical wizards.
  - Run transfers from iSeries command lines, CL programs, menus, API calls or scheduling software.
  - View complete transfer logging reports.
  - Run multiple data transfers concurrently.
  - Secure transfer definitions using authorization lists.
  - Encrypt and decrypt files using OpenPGP.

  Transfer Anywhere provides a flexible and expandable framework that can grow with your needs while hiding the complexities of data conversion and distribution.

  For more details, refer to:

  http://www.linomasoftware.com/modx/products/transferanywhere

- Alliance FTP Manager, by Patrick Townsend, is an Enterprise application for automating FTP file transfers. It includes FTP file exchange, spool file distribution, Pretty Good Privacy (PGP) encryption option, file compression, archival ability, Simple Mail Transport Protocol (SMTP) and Simple Network Management Protocol (SNMP) notification, automatic archival ability, APIs, and many other features for B2B e-Commerce applications.

  For more details, refer to:

  http://www.patownsend.com/FTPManager.htm

- Alliance Serial Connect, by Patrick Townsend, provides the connection of serial devices (RS-232 interface) to the IBM AS/400 over a TCP/IP network. It is ideal for connecting scales, data collection, process control, and other types of hardware devices with serial connections. It is a hardware and software solution, and configuration, system management, application logging, and data queue interfaces.

  For more details, refer to:

  http://www.patownsend.com/FTPManager.htm

- Alliance Series TCP/IP, by Patrick Townsend, provides AS/400 intranet and Internet TCP/IP Sockets Communications. Alliance series TCP/IP provides a reliable, automated AS/400 client/server communications interface for connecting PCs, workstations, and other hosts to an AS/400 via intranet and Internet TCP/IP networks. It is ideal for connecting Visual Basic, Access, CC++, UNIX, Web, and other applications to the AS/400 using standard TCP/IP communications. This application is enabled for the following technologies: RISC, Internet.

For more details, refer to:

http://www.patownsend.com/FTPManager.htm

- FTP/400, by RJS Software Systems, Inc., is a FTP native AS/400 product that allows AS/400 users to easily send and receive files to any Internet or intranet location via FTP. FTP/400 is a great way to interact with business partners, distribute information to remote FTP servers, and create library backups.

  For more details, refer to:

  http://www.rjssoftware.com/

- truExchange EDI-INT for iSeries, by nuBridges LCC, fits easily and securely into your environment. Unlike other Electronic Data Interchange - Internet Integration (EDI-INT) solutions, truExchange allows you to run your secure EDI-INT transactions in your existing network infrastructure without putting your private keys and unencrypted data in your demilitarized zone (DMZ). You save money and configuration time by reducing the need to rework your network or write bridging processes.

  With truExchange, your EDI-INT transactions can take place securely in your local area network (LAN) right next to your EDI translator. Security is ensured since no data or keys are accessible by intruders. nuBridges went the extra distance by writing its own clients and servers for EDI-INT transacting. What does that mean for you? It means the EDI-INT server can run wherever you want, for example, behind your firewall. However, for those who wish to stop incoming transactions in their DMZ, truExchange EDI-INT comes with an Application Statement 2 (AS2) server for your DMZ that only stores encrypted AS2transactions. Those transactions can either be retrieved by or redirected to your EDI-INT software in your LAN.

  For more details, refer to:

  http://www.nubridges.com/solutions/edi-int.htm

- truExchange FTP for iSeries, by nuBridges LCC, helps take control of any secure FTP process with the most comprehensive FTP client and server solution available. truExchange FTP offers solid security, an abundance of encryption options, and unmatched firewall navigation capabilities to give you total control of the way you exchange FTP transactions.

  It is the most automated FTP as well. The command-driven interface for FTP client scripting makes it possible to automate any FTP process through one script that includes user defined recovery within the session.

  The FTP Server can either replace, or run next to, the native iSeries server. The difference is that unlike the native server, truExchange FTP provides host-based control for file naming, formatting tracking, automatic application processing and features that allow you to run your FTP processes while allowing your iSeries be as secure as possible.

  truExchange FTP is perfect if you have to connect to EDI VANs, EDI trading partners, and banks, and if you have to manage internal FTP processes. Its features include:

  - Secure FTP Server
  - Data transformation between DB2 and CSV,XML
  - EDI Translator Integration (TrustedLink, Gentran, and so on)
  - Firewall navigation features
  - PGP, SSL/TLS, Secure Shell (SSH), and Secure / Multipurpose Internet Mail Extensions (S/MIME) encryption
  - Firewall testing tools and utilities
  - Intruder alerts

- IP address filtering / blocking
- CL based FTP scripting (MONMSG on GETS/PUTS)

For more details, refer to:

http://www.nubridges.com/solutions/ftp_iseries.htm

3.6.2 Data movement and migration

As stated earlier, the tools in this subcategory are used to select and copy data from one system to another, typically to consolidate data from unlike data sources. The tools in this subcategory are:

- DataMirror Transformation Server, by DataMirror Corporation, delivers improved conflict resolution, complex transformation, and usability to help businesses lower their total cost of ownership. The enhancements also expand the capabilities of the solution for Master Data Management, and SOA and Web Services applications.

  Transformation Server, DataMirror's high-performance real-time and bi-directional data integration solution, uses industry-leading log-based Change Data Capture (CDC) technology to capture changed data from existing database recovery logs, avoiding the overheads and risks associated with trigger-based and table-scan based solutions. Data changes are captured in the source system as they happen and flow immediately to the target database systems or middleware message queues, keeping distributed information up-to-date and in sync. Transformation Server 5.3, DataMirror's latest version, supports OS/400, z/OS, AIX, Solaris™, HP UNIX, Linux, and Windows platforms.

  For more details, refer to:

  http://www.datamirror.com/investors/pressrelease.aspx?newsId=142

- LANSA Integrator, by LANSA, enables integration of Application-to-Application (A2A) and Business-to-Business (B2B) transactions through XML and Java services. LANSA Integrator allows bi-directional XML — and other data formats — to be exchanged between you and your trading partners, regardless of platform. It also enables integration of user-written Java services with LANSA, C, RPG, and COBOL applications.

  What can LANSA Integrator do?

  - Automate orders between a manufacturer and distributor by dynamically linking ERP systems.
  - Exchange information between ATMs and server-based banking systems.
  - Integrate a Java-based credit card application with an order entry system.
  - Send and receive XML transactions between suppliers and distributors.
  - Exchange data between a stand-alone Wireless device and the server.
  - Publish or utilize third-party Web services via SOAP.
  - Provide SOAP interfaces to your existing business functions.
  - Integrate heterogeneous CRM and back-office systems via XML over MQ Series.
  - Provide secure (digital certificates and password protected) PDF documents via e-mail for contract agreements.
  - SMS updates on the status of order or delivery transactions in real-time.
  - And many more practical applications.

  For more details, refer to:

  http://www.lansa.com/products/integratoroverview.htm

- Transfer Anywhere, by Linoma Software, is an enterprise-level solution for retrieving, converting, compressing, encrypting, signing, and distributing data and files. This multi-purpose product not only allows you to easily share data within your organization, but can also be used to effortlessly exchange data with your trading partners. Its features include:
  - Installs using a straightforward installation wizard
  - Describes and reuses data sources and distribution lists
  - Defines and executes transfer definitions using intuitive graphical wizards
  - Runs transfers from iSeries command lines, CL programs, menus, API calls, or scheduling software
  - Views complete transfer logging reports
  - Runs multiple data transfers concurrently
  - Secures transfer definitions using authorization lists
  - Encrypts and decrypts files using Open PGP

  Transfer Anywhere provides a flexible and expandable framework that can grow with your needs while hiding the complexities of data conversion and distribution.

  For more details, refer to:

  http://www.linomasoftware.com/modx/products/transferanywhere

3.6.3 EAI/Application integration

The tools in this subcategory aid in the integration of enterprise applications include:

- XBintegrator, by INVENSO, is a powerful and rich development environment that enables a smooth integration of XML and other data formats, with intelligent workflow, validation, exception handling, and integration with all OS/400 objects.

  XBintegrator advantages:
  - Short learning curve.
  - Very short time-to-deployment.
  - High ROI value.
  - Shields complexity.

  XBintegrator has unique solutions on iSeries:
  - Creation/handling of all kind of XML documents.
  - XBids (XBintegrator Development Studio) is a multi-user and project based development environment with test/production support, code assistant and completion, help and wizard functions, drag and drop functions, SQL-builder, code generator and schema creation/validation/comparison.
  - MQ integration.
  - JMS bridge.
  - Native-IO or SQL DB access.
  - E-mail integration.
  - Socket communication.
  - Optimized XSLT functions.
  - Polling processes.

- Extensive ZIP function.
- Optimized IFS and directory management.

XBintegrator bridging modules:

- The database gateway connects all other databases.
- The IP protocol extender connects over HTTP, HTTPS, MAIL, FTP, and so on.

XBintegrator bridging modules:

- The database gateway connects all other databases.
- The IP protocol extender connects over HTTP, HTTPS, MAIL, FTP, and so on.
- The system and resource manager manages external devices.

For more details, refer to:

http://www.invenso.com/xb_integrator.php

- LANSA Data Secure Direct, by LANSA, takes the uncertainty out of complying with retailers requests for Applicability Statement 2 (AS2) compliance. Managing the process is made easy via LANSA's browser-based administration suite that includes trading partner profiles, certificate manager, and event viewer capability. The same LANSA technology is also used to provide Uniform Code Council (UCCNet) compliance, which involves secured transport of XML documents.

  What does it do? LANSA Data Secure Direct provides an easy-to-implement native Windows, iSeries, and AS/400 solution that installs on your production Server and integrates directly with your existing Electronic Data Interchange (EDI) translator product. LANSA can also perform the EDI mapping, if requested, as well as the direct integration to your line-of-business applications.

  For typical implementations, where there is an existing EDI translator in place, LANSA Data Secure Direct sits on top of that infrastructure and feeds that translator the unencrypted document. Consequently, it picks up outbound documents, encrypts those based on your trading partner profile, and sends them via AS2.

  For more details, refer to:

  http://www.lansa.com/products/datasecuredirect.htm

- LANSA Integrator, by LANSA, enables integration of Application-to-Application (A2A) and Business-to-Business (B2B) transactions through XML and Java services. LANSA Integrator allows bi-directional XML — and other data formats — to be exchanged between you and your trading partners, regardless of platform. It also enables integration of user-written Java services with LANSA, C, RPG, and COBOL applications.

  What can LANSA Integrator do?

  - Automate orders between a manufacturer and distributor by dynamically linking ERP systems.
  - Exchange information between ATMs and server-based banking systems.
  - Integrate a Java-based credit card application with an order entry system.
  - Send and receive XML transactions between suppliers and distributors.
  - Exchange data between a stand-alone Wireless device and the server.
  - Publish or utilize third-party Web services via SOAP.
  - Provide SOAP interfaces to your existing business functions.
  - Integrate heterogeneous CRM and back-office systems via XML over MQ Series.
  - Provide secure (digital certificates and password protected) PDF documents via e-mail for contract agreements.

- SMS updates on the status of order or delivery transactions in real time.
- And many more practical applications.

For more details, refer to:

http://www.lansa.com/products/integratoroverview.htm

- JMITOS.RMS, By L.D. Consulting NV, is a newly designed application for the iSeries. The application has been developed with the unique framework "Java Workflow Manager". The user interface has a perfect "Windows look and feel" and the Java based workflow manager offers a unusual high degree of support and performance. Database and Business Logic, written in RPG-ILE, remains on the iSeries. Seamless integration of MS-applications and communication software (Lotus Notes) is available. Connecting existing databases is an important feature. There is a multi-company approach, and the output is generated as a PDF file using XML technology. Dynamic Storage Allocation and a Virtual Database Concept offer a extremely high performance online management information tool. The application does not require the interactive feature on the iSeries. The application can be installed and used independently or as part of our vertical business solutions (my.ERP). GAN/i5 is needed.

  For more details, refer to:

  http://www.ldc.be/

- Transidiom, by Seagull Software, is ideally suited to help close the gaps among core business processes running in existing systems and new requirements. Transidiom, the programmatic integration module of LegaSuite, transforms mainframe, iSeries, UNIX/VT, client/server Windows and Web applications into reusable business components with bidirectional XML, J2EE, .NET, and Web services interfaces, without changing a single line of existing code. All integration standards are supported from a single development effort. As a result, existing applications become shareable business services for rapid, agile software delivery, composite application assembly, and integration with SOA. And unlike other solutions, with Transidiom offers integration at any point in the application stack: Screen, Transaction, or Database.

  Transidiom is especially powerful for building connectors. While most standards-compliant software vendors offer generic connectors, they typically require significant and complex customized coding. Transidiom automates connector development, so you can build connectors over 70 percent faster than any other method – all with no coding. Because interfaces published with Transidiom are based on industry standard XML and SOAP, you can easily connect to other architectures that are XML-compliant, including WebSphere.

  For more details, refer to:

  http://www.seagullsoftware.com/products/transidiom.html

- Convertigo 3.2 SP4, by TWinSoft, allows access to existing applications in a non-intrusive way. That is it requires no modifications to the existing applications. This is accomplished by using their existing exposed interfaces like 3270/5250/VT/DKU user screen interfaces or IBM CICS COMMAREA.

  Convertigo is composed of three editions to address all the integration needs:

  - Convertigo publishing edition builds intranets or extranets from existing applications or integrates them in enterprise portals (Webization).
  - Convertigo mobile edition accesses existing applications through mobile devices, such as PDAs, smart phones, or mobile PCs.
  - Convertigo connector edition integrates existing applications in new SOA based information systems by using the SOAP Web service technology.

For more details, refer to:

http://www.twinsoft.fr/intl/en/cariocaweb/convertigo_present.htm

3.7 Tools to integrate business processes

The System i Developer Roadmap defines *Integrate business processes* as having systems and applications working together, connecting with suppliers and clients to achieve efficiencies, better communication, and services. The subcategories in this step are:

- Business integration: Tools that aid in the integration of business processes.
- Content/Image management: Tools that allow existing or new applications to integrate with content/imaging systems for capture and management of content.
- Data synchronization: Tools that meet UCCNet mandates for synchronization of product item data.
- e-commerce: Tools that can be customized with minor effort to integrate a Web shopping cart type application with core business applications.
- EDI/XML: Electronic data interchange tools for moving data between vendors in the supply chain.
- FAX: Tools that automate the integration of print output of existing applications with FAX interfaces.
- Programmable logic controller: Tools and software for interfacing with programmable logic controllers.
- Telephony: Tools that allow existing or new applications to integrate with telephone switches for inbound and outbound calling.
- Workflow: Tools that provide enablers to force an application to run in a specific sequence and may force specific users to complete process steps.

Business integration is the subcategories that applies directly to application modernization and integration.

3.7.1 Business integration

Business integration consists of tools that aid in the integration of business processes. The ISVs tool that fits into this subcategory is LANSA Integrator.

LANSA Integrator, by LANSA, enables integration of Application-to-Application (A2A) and Business-to-Business (B2B) transactions through XML and Java services. LANSA Integrator allows bi-directional XML — and other data formats — to be exchanged between you and your trading partners, regardless of platform. It also enables integration of user-written Java services with LANSA, C, RPG, and COBOL applications.

What can LANSA Integrator do?

- Automate orders between a manufacturer and distributor by dynamically linking ERP systems.
- Exchange information between ATMs and server-based banking systems.
- Integrate a Java-based credit card application with an order entry system.
- Send and receive XML transactions between suppliers and distributors.
- Exchange data between a stand-alone Wireless device and the server.
- Publish or utilize third-party Web services via SOAP.

- Provide SOAP interfaces to your existing business functions.
- Integrate heterogeneous CRM and back-office systems via XML over MQ Series.
- Provide secure (digital certificates and password protected) PDF documents via e-mail for contract agreements.
- SMS updates on the status of order or delivery transactions in real-time.
- And many more practical applications.

For more details, refer to:

http://www.lansa.com/products/integratoroverview.htm

4

IBM tools for application modernization and integration

This chapter introduces the IBM tools that are part of the IBM System i Tools Innovation program that:

- Enable modernization of System i business applications
- Enable the integration of System i applications and resources with other operating environments, including .NET

4.1 IBM tools in the System i Tools Innovation Program

IBM provides a wide variety of tools to support the complete application development life cycle and to support specific client needs. IBM provides middleware used to run applications in a secure and robust environment. Specific IBM tools and middleware are included in the System i Tools Innovation program.

A key goal of the System i Tools Innovation program is to help clients and ISVs modernize and extend their applications and to integrate their applications with other operating environments, including .NET. The Tools Innovation program is aligned with the System i Developer Roadmap and identifies tools within each step. The various roadmap steps are:

- *Improve your productivity*: Identifies integrated development environments with graphical presentation, desktop capabilities, and integrated test/debug.
- *Enhance the end-user experience*: Encompasses taking the application presentation to the next level with browser, client-server, and pervasive technologies.
- *Create a modular architecture*: Provides vehicles to separate the user presentation, business logic, and database access, creating reusable application and database callable modules.
- *Integrate applications*: Provides tools for adopting new technologies, optimizing access to applications and business logic, and integrating applications, maximizing reuse.
- *Integrate business processes*: Allows systems and applications to work together, connecting with suppliers and clients to achieve efficiencies, better communications, and service.

For details on the System i Tools Innovation program, refer to:

`http://www.developer.ibm.com/vic/hardware/portal/iii_pages/iii_tools_innov_index`

For details on the System i Developer Roadmap, refer to:

`http://www.ibm.com/servers/eserver/iseries/roadmap/index.html`

4.2 Tools to improve your productivity

As defined by the System i Developer Roadmap, the *Improve your productivity* step identifies integrated development environments with graphical presentation, desktop capabilities, and integrated test and debug capabilities, which enable developers to modernize existing applications. The subcategories of this step are:

- Availability: Tools used to provide “hot” backup systems that allow a client to continue to operate if their primary system fails.
- Backup/Recovery: Tools used to manage scheduled backup and manage the media used for the backup, and to facilitate application recovery after a failure.
- Code analysis, documentation, and tracking: Tools for analysis of code that provide documentation and tracking information for use by developer. This supports modernizing an existing application by moving existing applications to modular code.
- Database editor and viewer: Tools for viewing, managing, and accessing DB2/400 data.
- Education: Tools to assist with the delivery of education.
- Help desk: Tools for help desks.
- Integrated development environments: Integrated tools for creating and maintaining new and existing applications.

- Migration/conversion of existing tools: Tools for migrating and converting System 36 and AS400 code to RPG, COBOL, and ILE.
- Operations: Tools that enable planning, distribution, evaluation and control of work in a system or network.
- Performance/tuning: Tools for optimizing the performance of applications, servers, databases, or network.
- Secure your enterprise: Tools that work with or extend OS/400 security resources for both local and network resources.
- Source control/debug/test/deploy: Tools to support development, and managing control of source code, testing, debugging, and deploying of code.
- Test data management: Tools to create, amend and maintain accurate test data for application testing, support and training.

The subcategories that pertain directly to business application modernization and integration are:

- Code analysis, documentation and tracking tools

  IBM relies on ISVs to provide tools in this subcategory.
- Integrated development environments

4.2.1 Integrated development environments

Integrated development environments (IDE) allow you to create and maintain new and existing applications. An IDE enables application developers to modernize applications by having tools that support the complete development life cycle all located in one place. These tools are also valuable when extending or integrated applications. The IBM tools included in this subcategory are:

- DB2 Development Center (formerly known as the DB2 Stored Procedure Builder) is a rapid iterative development environment for developing stored procedures, user-defined functions, and much more. This client-based development tool supports the entire DB2 UDB Family of servers, so it is an especially useful tool if you are developing and deploying procedures on multiple DB2 UDB servers.

  For more details, refer to:

  http://www.ibm.com/software/data/db2/udb/dc/
- IBM Toolbox for Java is a library of Java classes that give Java programs easy access to iSeries or AS/400 data and resources. JTOpen is the open source version of Toolbox for Java.

  What is Toolbox for Java?

  The IBM Toolbox for Java is a library of Java classes supporting the client/server and Internet programming model to an iSeries or AS/400 server.

  Features:

  – JTOpen is the open source version of the IBM Toolbox for Java licensed program product.
  – Toolbox and JTOpen downloads: Download the latest pre-built version of the JTOpen jar files, as well as the latest Toolbox LPP files.
  – Programmer's Guide: Information that will help you understand and use the IBM Toolbox for Java.

For more details, refer to:

http://www.ibm.com/servers/eserver/iseries/toolbox/overview.html

- WebSphere Development Studio Client for iSeries (Development Studio Client) V6.0 inherits and extends Rational® Web Developer (RWD) V6.0 to deliver an integrated development environment (IDE) and tools for developing Java, Web, Web services, client/server, and iSeries server applications, in languages like RPG and COBOL. The iSeries enhancements to Development Studio Client V6.0 make it easy to create, test, deploy, and maintain sophisticated e-business applications with little Java, Web, or Web-service programming.

  For more details, refer to:

  http://www.ibm.com/software/awdtools/wdt400/

- WebSphere Development Studio Client Advanced Edition for iSeries (Development Studio Client Advanced Edition) V6.0 inherits the improved Web, Enterprise Java Bean (EJB), and Java 2 Platform, Enterprise Edition (J2EE) development capabilities from Rational Application Developer (RAD) V6.0. It also provides support that makes it easy to integrate Web and Web-enabled applications using the IBM WebFacing Tool into the IBM WebSphere Portal server.

  The client component is designed to help you accomplish three primary programming goals:

  – Develop and maintain iSeries applications
  – Create Web front ends to iSeries business logic
  – Create GUI front ends to iSeries business logic

  For more details, refer to:
  http://www.ibm.com/software/awdtools/wdt400/

- WebSphere Development Studio Client (WDSc) Lite: IBM is introducing a technology preview Lite version of WebSphere Development Studio Client that offers the main functions that the RPG developers want and need to access. WDSc Lite uses just 256 MB of memory and allows you to create, edit, compile, and debug your RPG applications. To get the Lite version, you must first install the full product.

  For more details, refer to:

  http://www.ibm.com/software/awdtools/wdt400/

- WebFacing Deployment Tool combines WebFacing and Host Access Transformation Server (HATS) (introduced in January 2006) into a single runtime. WebFaced applications can interact with 5250 applications in a Web browser via HATS. This simplifies application modernization and the extension of many existing applications to the Web without redoing the existing application. By sharing a common runtime, WebFaced applications can call a non-WebFaced green screen application and HATS will do the convert for the called green screen on-the-fly to present the same look and feel of the WebFaced application.

  For more details, refer to:

  http://www.ibm.com/software/awdtools/wdt400/

4.3 Tools to enhance the end-user experience

The System i Developer Roadmap defines the *Enhance the end-user experience* step as taking the application presentation to the next level with browser, client-server, and pervasive technologies.

- Application refacing: Tools to put a graphical front end on existing 5250 application (rich or browser GUI) with little or no programmer intervention.
- Application servers: Runtime environments and management tools for J2EE and Web service based applications.
- Domino servers: Server component of Lotus Domino Family of integrated messaging, collaboration, and Web application software.
- Online analytical processing: Tools that perform analytical processing over historical data.
- Portal and personalization: Tools for setting up Web portal interfaces and creating personalized user interfaces.
- Query/report writing: Tools that are used by end users and analysts to present the results of queries into the historical data either for display or print.
- Report and data delivery: Tools for retrieving, managing, mailing, distributing, importing, and using printed data for jobs.

The tools directly associated with modernization and integration are in the following subcategories:

- Application refacing
- Application servers
- Portal and personalization

4.3.1 Application refacing

This subcategory includes tools to put a rich or browser graphical front end (GUI) on an existing 5250 application. A key aspect of application refacing is to minimize the amount of programmer intervention required to put this graphical front end on the application. The IBM tools included in this subcategory are:

- IBM Host Access Client Package allows you to manage migration to Web-to-Host technologies at your own pace. With one package, you can support a diverse user community, eliminating the need to work with multiple vendors. At one price per user, you can provide access to existing applications for any user. Included are Personal Communications for traditional emulation and WebSphere Host On-Demand for Java emulation. You can also create custom e-business applications with a comprehensive set of APIs.

  The IBM Host Access Client Package is the solution for all of your host connection needs. The package provides:

  - Access to applications and data residing on AS/400 (5250), S/390® (3270), and DEC/UNIX (VT) hosts for traditional and Web users in Systems Network Architecture (SNA) and intranet environments.
  - Thin client technology to distribute host access capability to remote users, as well as users in intranet and extranet environments.
  - Support for SNA, Advanced Program to Program Communications (APPC), High Performance Routing (HPR), and other related technologies.

For more details, refer to:

http://www.ibm.com/software/network/hostaccess/

- IBM WebSphere Host Integration quickly extends host applications to the Web without changing the existing applications and along with these capabilities:
  - Allows the creation and deployment of new host access on demand business applications with a strong set of APIs and Java programming tools and WebSphere Application Server Network Deployment.
  - Supports Java, Hyper Text Markup Language (HTML), and eXtensible Markup Language (XML) delivery of host data from multiple sources, such as S/390, AS/400, VT, and JDBC™ databases.
  - Works with other members of the WebSphere family of products to dynamically extend the reach of host data and applications beyond the Web to pervasive technologies, such as smart phone devices and personal digital assistants (PDAs).

  For more details, refer to:

  http://www.ibm.com/software/webservers/hostintegration/

- IBM WebFacing Tool: With the IBM WebFacing Tool, you can quickly convert your data description specifications (DDS) display file source members so that the user interface of your iSeries programs can run in a browser. The WebFacing Tool facilitates the conversion process through user-friendly wizards for selecting the 5250 application's DDS source, converting it, and deploying the new Web-based interface to your program as a WebSphere application. JavaServer Pages and XML files are generated at development time and take the place of your DDS code, allowing for flexibility in customizing the appearance of your new interface prior to run time. Using the WebFacing style properties, you can change attributes in your pages, such as graphics, fonts, colors, and layouts. To change a previously converted application, you can simply re-convert it and select a new style.

  For more details, refer to:

  http://www.ibm.com/software/awdtools/wdt400/about/webfacing.html

- IBM WebSphere Host Access Transformation Services for iSeries (HATS) delivers all the tools you need to quickly and easily extend your existing applications to business partners, clients, and employees. HATS makes your 3270 and 5250 applications available as HTML through the most popular Web browsers, while converting your host screens to a Web look and feel. With HATS, it is easy to improve the workflow and navigation of your host applications without any access or modification to source code.

  This tool allows you to:
  - Extend host applications to the Web quickly: The HATS rules-based transformation engine makes it possible to extend your host applications to the Web within hours of installing the software. HATS is a zero-footprint, zero-download, Web-to-host solution. The only software needed on the client is a Web browser.
  - Transform host screen components in real time: The power of HATS lies in its ability to accurately recognize the components of host screens and transform them in real time to a Web interface according to a set of predefined rules. It is easy to modify the rules according to the specific needs of your application. With HATS, you can add a variety of elements to your host screens, such as drop-down lists, hot links, tables, buttons, valid value lists, tabbed folders, and graphs. You can also add HTML elements, such as logos, graphics, backgrounds, and Web links.
  - Provide programmed navigation through multiple existing screens: HATS has macro support that allows you to provide programmed navigation through multiple existing screens to improve the productivity and ease of use of your host applications. HATS

enables such programmed access to a single host application, or can integrate screens from multiple host applications into a single Web interface. You can also use macros created in IBM WebSphere Host On-Demand.

- Integrate with WebSphere software: The HATS Toolkit is fully integrated with the Eclipse-based IBM Software Development Platform. It offers an intuitive interface for customizing the rules for transformation of host screens. The HATS applications can be deployed to both WebSphere Application Server and WebSphere Portal, and can take advantage of the extensive security and reliability features found in both platforms.

New in Version 6:

- Easier-to-use drag and drop screen customization
- New wizards to customize HATS components and widgets
- Enhanced macro support with macro stepping feature
- Side-by-side preview of host screens and HATS
- JavaServer Faces support Integration Objects for easier Web page design
- CICS Basic Mapping Support (BMS) map importer for offline editing
- Improved 5250 subfile recognition, rendering, and customization

For more details, refer to:

http://www.ibm.com/software/webservers/hats/

- iSeries Access for Web offers browser-based access to iSeries servers. iSeries Access for Web enables end users to leverage business information, applications, and resources across an enterprise by extending the iSeries resources to the client desktop through a Web browser.

  iSeries Access for Web:

  - Is server based.
  - Is implemented using Java Servlet technology.
  - Uses industry standard protocols: HTTP, HTTPS, and HTML.
  - Is lightweight, requiring only a browser on the client.
  - Runs batch commands, provides access to database, integrated file system, printers, printer output, and messages, and a 5250 interface.

  For more details, refer to:
  http://www.ibm.com/servers/eserver/iseries/access/web/

- iSeries Navigator for the Web: Several key iSeries Navigator tasks are now available from a Web browser, at no additional cost! Remotely access tasks from functional areas such as Basic Operations, Work Management, Configuration and Service, and Database. These tasks can be used without installing iSeries Access for Windows or iSeries Navigator. Everything you need to access these tasks is already installed on your V5R3 iSeries system. For more information about the specific tasks available, see the topic "Work with iSeries Navigator tasks on the Web" in the Information Center.

  The following iSeries Navigator functions are available to work with on the Web:

  - Messages, user jobs, and printer output in basic operations
  - Active jobs, server jobs, output queues, and subsystems in work management
  - System values in configuration and service
  - Database objects in database

For more details, refer to:

http://www.ibm.com/servers/eserver/iseries/navigator/index.html

- WebFacing Deployment Tool combines WebFacing and Host Access Transformation Server (HATS) (introduced in January, 2006) into a single runtime. WebFaced applications can interact with 5250 applications in a Web browser via HATS. This simplifies application modernization and the extension of many existing applications to the Web without redoing the existing application. By sharing a common runtime, WebFaced applications can call a non-WebFaced green screen application and HATS will do the convert for the called green screen on-the-fly to present the same look and feel of the WebFaced application.

  For more details, refer to:

  http://www.ibm.com/software/awdtools/wdt400/

- WebSphere Development Studio Client for iSeries (Development Studio Client) V6.0 inherits and extends Rational Web Developer (RWD) V6.0 to deliver an integrated development environment (IDE) and tools for developing Java, Web, Web services, client/server, and iSeries server applications, in languages like RPG and COBOL. The iSeries enhancements to Development Studio Client V6.0 make it easy to create, test, deploy, and maintain sophisticated e-business applications with little Java, Web, or Web-service programming.

  For more details, refer to:

  http://www.ibm.com/software/awdtools/wdt400/

- WebSphere Development Studio Client Advanced Edition for iSeries (Development Studio Client Advanced Edition) V6.0 inherits the improved Web, Enterprise Java Bean (EJB), and J2EE development capabilities from Rational Application Developer (RAD) V6.0. It also provides support that makes it easy to integrate Web and Web-enabled applications using the IBM WebFacing Tool into the IBM WebSphere Portal server.

  The client component is designed to help you accomplish three primary programming goals:

  - Develop and maintain iSeries applications.
  - Create Web front ends to iSeries business logic.
  - Create GUI front ends to iSeries business logic.

  For more details, refer to:
  http://www.ibm.com/software/awdtools/wdt400/

4.3.2 Application servers

The application servers provide runtime environments and management tools for J2EE and Web service based applications. The IBM application servers are:

- WebSphere Application Server - Express V6.0 for OS/400 provides the foundation for serving dynamic content via servlets and JavaServer Pages (JSPs). WebSphere Application Server also offers XML document services that implement server-side XML document processing. WebSphere Application Server also provides support to enable iSeries to run Enterprise JavaBeans.

  For more details, refer to:

  http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/express/product/announceexp60.html

- WebSphere Application Server V6.0 for OS/400 provides the foundation for serving dynamic content via servlets and JavaServer Pages (JSPs). WebSphere Application Server also offers XML document services that implement server-side XML document

processing. WebSphere Application Server also provides support to enable iSeries to run Enterprise JavaBeans.

For more details, refer to:

http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/product/announceb60.html

- WebSphere Application Server Network Deployment V6.0 for OS/400 provides an operating environment with advanced performance and availability capabilities in support of dynamic application environments. In addition to all of the features and functions within the Base WebSphere Application Server product, this configuration delivers advanced deployment services that include clustering, edge-of-network services, Web services enhancements, and high availability for distributed configurations.

  For more details, refer to:

  http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/product/announcend60.html

For more details on the various versions of these and other application servers, refer to:

http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/

4.3.3 Portal and personalization

The tools in the portal and personalization subcategory are used for setting up wEb portal interfaces and creating personalized user interfaces. The IBM tools in this subcategory are:

- WebSphere Portal - Express for Multiplatform combines features of the WebSphere Portal family with simplified installation and the option for user or processor-based licensing. This combination enables small businesses as well as departments within larger companies to more easily deploy sophisticated employee, IBM Business Partner, and client portals.

  WebSphere Portal - Express for Multiplatforms, Version 5.0.2 contains the customizable portal, an integrated document manager, a selection of portlets, the toolkit for creating new portlets, and the WebSphere Application Server for running the portal. Its features include:

  - Increase employee productivity through easy access to critical business applications and information.
  - Improve client and IBM Business Partner satisfaction and loyalty resulting from portals that are customized to each user's unique needs and interests.
  - Reduce costs for building and maintaining first class portals.
  - Quickly build portals to simplify and accelerate access to personalized information and applications.

  For more details, refer to:

  http://www.ibm.com/servers/eserver/iseries/software/websphere/portal/express.html

- WebSphere Portal - Express Plus for Multiplatform V 5.0.2 provides support for System i5 and includes all of the features of WebSphere Portal - Express for Multiplatforms. In addition, it includes team work spaces creating online environments that help team members work together more effectively and instant messaging for real-time collaboration with your clients, trading partners, and teammates. Its features include:

  - Team calendar to keep track of shared calendar events in the team work space.
  - Manage projects, assign tasks, and track milestones of specific projects or initiatives.
  - Display online status for portal user names that appear in portlets. To initiate a chat, just right-click the name of a user who is online and choose **Chat**.

For more details, refer to:

http://www.ibm.com/software/genservers/portalexpress/plus/

- The WebSphere Portal Enable for Multiplatforms offering is the basic edition of WebSphere Portal for Multiplatforms. It helps you quickly build scalable portals to simplify and accelerate access to personalized information and applications.

  New capabilities in WebSphere Portal Enable, Version 5.1 include:

  - Through business process integration, WebSphere Portal now combines people and applications at a process level; the result is that people are more productive and processes are executed faster. Portal's navigation paradigm is now not only role-based, but also includes workflow orchestration that present users with the tasks they need to complete and all information and applications needed to complete the task or decision quickly.
  - Create multiple portal sites on one instance of WebSphere Portal. Each site has its own URL, look and feel, pages, users and groups, and search index. All sites can share the same software and hardware, which lowers capital, maintenance, and administration costs while expanding the business value of portal to new communities.
  - A new integrated version of IBM Workplace Web Content Management™ is also included with WebSphere Portal, so you keep your portal up-to-date with accurate content created by portal users (usage restrictions apply).
  - Redesigned installation procedure and improved administration portlets so you quickly get a return on your investment while using fewer IT resources.
  - The user interface for Portal Document Manager has been enhanced so users can easily share, view, and organize files of all types ranging from documents to spreadsheets within the Portal community. It now offers category subscription services, simple approval processes for file contribution, versioning so that users can track the evolution of a piece of content, and access control for managing viewing privileges of different content items.
  - DB2 Content Manager runtime repository is now included to manage all forms of content (Web, e-mail, documents, digitized paper documents, images, audio/video, and text messages) consistently.
  - Improved portal search technology allow users to dynamically search across all portal content while adhering to access control limits.

  WebSphere Portal Enable continues to provide the following functions that help to improve employee productivity and client loyalty:

  - Portal Application Integrator which allows business users to quickly create portlets for interacting with relational databases, Domino databases, and enterprise applications from Oracle, SAP, Siebel, and PeopleSoft.
  - Click-to-action (C2A) technology for portlet-to-portlet communication and action, ensuring accuracy of information passed and delivering it on demand.
  - Productivity Components, which allow users to view, create, convert, and edit basic documents, spreadsheets, and presentation files from the portal interface. Therefore, they can execute *ad-hoc* business process from the same place they access their applications, search for information, and collaborate with other employees and partners. The productivity components are integrated with the document management feature so files can be indexed, categorized, and searched by other portal users.
  - Integration services that give you access to enterprise data, applications, news feeds, and Web services.
  - Publish local portlets as remote Web services or subscribe to Web services to make them available to portal users via portlets.

- Presentation services that allow for the customization of the computing desktop to match individual work patterns and roles
- Powerful personalization technology, so portal users get a unique experience based on their role and business rules
- WebSphere Translation Server functionality, which helps you to translate the contents of portlets from English to French, Italian, German, Spanish, Portuguese, Taiwanese, Japanese, Simplified Chinese, or Traditional Chinese. Or you can translate your portlet content from those languages to English.

For more details, refer to:

http://www.ibm.com/software/genservers/portal/enable/

- Workplace Services Express provides an easy to install and use collaborative environment that can run on a single server. Users can create, edit, and share information and documents, whether they use Microsoft Windows, Linux, Microsoft Office, i5/OS, or a Web browser.

  Workplace Services Express comes pre-loaded with ready-to-use team tools (portlets) and templates so people and teams can get results and make decisions, quickly.

  Built-in business instant messaging and a portal mean that it is easy to extend collaboration to other people and business applications. IBM Workplace products provide the front-end to the IBM service-oriented architecture (SOA) strategy.

  For more details, refer to:

  http://www.ibm.com/software/workplace/products/product5.nsf/wdocs/workplaceservicesexpresshome

- Workplace Collaboration Services is a single product that provides a full range of integrated ready-to-use communication and collaboration tools that enable people to do their jobs more effectively – anytime, anywhere. With the flexibility to deploy any mix of capabilities, it provides a ready-made foundation to build customized role-based Workplace environments that provide the tools and information people need to do their work more efficiently.

  Workplace Collaboration Services is available as a fully integrated product or with the option to purchase the capabilities separately, such as Workplace Messaging. Workplace Collaboration Services is built on a componentized architecture that is adaptable to enable people and teams to react fast to changing business needs. IBM Workplace products provide the front end to the IBM SOA strategy.

  IBM Workplace Collaboration Services 2.6 delivers an integrated collaborative environment that includes a wide range of capabilities like e-mail, calendaring, presence awareness, instant messaging, learning, team spaces, Web conferencing, and document and Web content management. The underlying SOA provides a flexible and easy way to deploy just the capabilities any given individual needs.

  For more details, refer to:

  http://www.ibm.com/software/workplace/products/product5.nsf/wdocs/workplacehome

4.4 Tools to create a modular architecture

The System i Developer Roadmap defines the *Create a modular architecture* step as the separation of user presentation, business logic, and database access, thereby creating reusable application and database callable modules.

- Business rule logic extraction for SOA: Tools to extract business rule logic from existing interactive RPG/COBOL into new components for deployment in SOA environments.

- Client integration: Tools for connecting client systems to iSeries and connecting client applications.
- .NET integration: Tools that provide integration between iSeries and .Net applications.
- Regenerate RPG into J2EE: Tools to convert 5250 display files into Java Server Facing (JSF) or JavaServer Pages (JSP) and converts RPG input output into Java SQL. Also included are tools that convert or transform RPG to Java.
- RPG to Java conversion: Tools to convert RPG code to Java code.
- SOA Framework Tools: Tools that provide a framework used to create and maintain modular applications with full separation of business logic, database, and presentation layers. The tools are also capable of creating Web services.

Even though all the subcategories in this step are of interest to modernization and integration, IBM provides tools for these subcategories:

- Client integration
- .NET integration
- SOA framework tools

4.4.1 Client integration

The Client integration subcategory consists of tools for connecting client systems to iSeries and or connecting client applications. The IBM tools in this subcategory are:

- DB2 Connect™ makes your company's host data directly available to your Personal Computer (PC) and local area network (LAN)-based workstations.

  It connects desktop and mobile device applications to your company's mainframe and minicomputer host databases, leveraging your enterprise information no matter where it is!

  DB2 Connect provides the application enablement and robust, highly scalable communication infrastructure for connecting Web, Windows, UNIX, Linux, and mobile applications to z/OS and AS/400 data.

  Features at a glance:

  - Seamlessly connects popular desktop applications to S/390 and AS/400 data.
  - Enables fast, secure access to existing data through intranets, extranets or the public Internet.
  - Integrates new Web-based applications with existing core business applications
  - Provides the performance, scalability, reliability, and availability needed for the most demanding e-commerce, customer relationship management (CRM), business intelligence (BI), and enterprise resource planning (ERP) applications.
  - Provides extensive application programming tools for developing client-server and Web applications using industry standard application program interfaces (APIs), such as Open Database Connectivity (ODBC), ActiveX Data Object (ADO), Object Linking & Embedding Data Base (OLE DB), Java Database Connectivity (JDBC), SQLJ, DB2 CLI, and Embedded SQL.
  - Allows you to build new Internet applications and extend existing applications such as data warehousing, data mining, Online Transaction Processing (OLTP), and Online Analytical Processing (OLAP) to the Web.
  - Integrates with both Java and Microsoft models for developing new Web-based applications.

– Energizes mobile PC users and users of the new pervasive computing devices with reliable, up-to-date data from S/390 and AS/400 database servers.

For more details, refer to:

http://www.ibm.com/software/data/db2/db2connect/

- iSeries Access for Windows (called "Client Access Express for Windows" in V5R1 and earlier releases) delivers Transmission Control Protocol/Internet Protocol (TCP/IP) connectivity to users running a variety of Microsoft Windows operating systems. iSeries Access for Windows offers an all-inclusive client solution for accessing and using resources from your Windows desktop. It includes 5250 emulation, access to DB2 Universal Database (UDB) for iSeries through its Data Transfer, and utilizes iSeries NetServer™ for working with the OS/400 Integrated File System and printers. It also has a variety of middleware for using and developing client applications to access OS/400 resources, and iSeries Navigator, the OS/400 GUI, for administering iSeries and AS/400 servers.

  The use of PC5250 and Data Transfer in iSeries Access for Windows and Client Access Express requires an iSeries Access Family (5722-XW1) license.

  For more details, refer to:

  http://www.ibm.com/servers/eserver/iseries/access/windows/

4.4.2 .NET integration

The tools in this subcategory provide integration between System i and .Net applications. The IBM tools in this subcategory are covered in 5.3.2, “IBM tools for integration” on page 80.

4.4.3 SOA framework tools

The SOA framework tools provide a framework used to create and maintain modular applications characterized with full separation of business logic, database, and presentation layers. Also included in this subcategory are tools capable of creating Web services. The IBM tools that support this subcategory are found in 7.4.1, “IBM tools for creating Web services and promoting SOA” on page 95. The IBM application servers that support this subcategory are found in 7.4.2, “IBM Application servers” on page 97.

4.5 Tools to integrate applications

The System i Developer Roadmap defines *Integrate applications* as adopting new technologies, optimizing access to applications and business logic, and integrating applications, maximizing reuse. The subcategories in this step are:

- Bar code/Forms/RFID: Tools that print bar codes and RFID labels and special forms that may include bar codes and RFID labels.
- Connectivity: Tools that aid in the connectivity of unlike systems.
- Data movement and migration: Tools that are used to select and copy data from one system to another, typically to consolidate data from unlike data sources.
- EAI/Application integration: Tools that aid in the integration of enterprise applications.
- Extract/Transform/Load: Data warehouse extraction, transformation, or load tools for changing the format, and cleansing and loading of source data for a data warehouse.
- Mail and Messaging: Tools that enable the exchange of mail and messages between e-mail systems.

- Payment servers: Tools for interfacing with credit card and other payment processing services.
- Wireless: Tools that enable wireless solutions.

IBM provides tools in these subcategories that aid in modernization and integration:

- Connectivity
- Data movement and migration
- EAI/Application integration

4.5.1 Connectivity

This subcategory includes tools that aid in the connectivity of unlike systems. The IBM tool in this subcategory is:

- DB2 Connect makes your company's host data directly available to your PC and LAN-based workstations.

  It connects desktop and mobile device applications to your company's mainframe and minicomputer host databases, leveraging your enterprise information no matter where it is!

  DB2 Connect provides the application enablement and robust, highly scalable communication infrastructure for connecting Web, Windows, UNIX, Linux, and mobile applications to z/OS and AS/400 data.

  Features at a glance:

  - Seamlessly connects popular desktop applications to S/390 and AS/400 data.
  - Enables fast, secure access to existing data through intranets, extranets, or the public Internet.
  - Integrates new Web-based applications with existing core business applications.
  - Provides the performance, scalability, reliability, and availability needed for the most demanding e-commerce, CRM, BI, and ERP applications.
  - Provides extensive application programming tools for developing client-server and Web applications using industry standard APIs, such as ODBC, ADO, OLE DB, JDBC, SQLJ, DB2 CLI, and Embedded SQL.
  - Allows you to build new Internet applications and extend existing applications such as data warehousing, data mining, OLTP, and OLAP to the Web.
  - Integrates with both Java and Microsoft models for developing new Web-based applications.
  - Energizes mobile PC users and users of the new pervasive computing devices with reliable, up-to-date data from S/390 and AS/400 database servers.

  For more details, refer to:

  `http://www.ibm.com/software/data/db2/db2connect/`

4.5.2 Data movement and migration

As stated earlier, the tools in this subcategory are used to select and copy data from one system to another, typically to consolidate data from unlike data sources. The tools in this subcategory are:

- DB2 Migration Toolkit (MTK) helps you migrate from Oracle, Sybase ASE, Sybase SQL Anywhere, Microsoft SQL Server, Informix IDS and XPS, and MySQL to DB2 UDB on Windows, UNIX, and Linux, DB2 on iSeries, DB2 on z/OS, as well as Informix Dynamic

Server. The IBM Migration Toolkits are available in English on a variety of platforms, including Windows, AIX, Linux, HP-UX, and Solaris.

DB2 Migration Toolkit Version 1.4 is currently available for the Windows platforms (Windows 2000 and XP). MTK 1.3 is available on Windows, Linux, and various UNIX platforms, including AIX, HP-UX, and Solaris. The MySQL to DB2 Toolkit is available on Linux. For source/target combinations not listed above and for information about their use on other operating systems platforms, please contact IBM.

These toolkits enable the migration of complex databases through their fully functioning GUI interfaces, which provide multiple options to further refine and customize each migration. For example, you can change the default choices that are made about which DB2 or IDS data type to be used to map to the corresponding source database data type. The toolkits also converts to, and refines, various DB2 and IDS database scripts. This model also makes the toolkits very portable, making it possible to import and convert on a machine remote from where the source or target databases are installed.

For more details, refer to:

http://www.ibm.com/software/data/db2/migration/mtk/

- IBM DataPropagator™ leverages the SQL replication architecture to flexibly manage scheduling, transformation, and distribution topologies.

  It efficiently and effectively populates data warehouses or marts, maintaining data consistency between disparate applications, or efficiently managing distribution and consolidation configurations involving central locations and distributed branch or retail sites.

  The replication server supports distribution (moving data from one database to many) and consolidation (moving data from many databases to one) scenarios.

  Data can be filtered either horizontally or vertically so that only relevant data is replicated.

  Transformation can be applied inline with the data movement via standard SQL expressions or stored procedure execution.

  Data movement can be automated on a specific schedule, at designated intervals, continuously, or event-driven.

  Data movement can be managed a table-at-a-time, such as for warehouse loading during batch windows, or with transaction consistency, for data which is never offline.

  For more details, refer to:

  http://www.ibm.com/software/data/integration/replication/

- IBM Lotus Enterprise Integrator® (LEI) for iSeries provides for data transfer and manipulation between non-Domino data sources and Domino applications. Data movement can be accomplished in batch mode, as well as real-time interactive mode.

  LEI users can choose from three approaches to access non-Domino data:

  - LEI activity definitions, which are parameter driven and do not require programming
  - Data Connection Resources (DCRs) built into applications with the Domino Designer®
  - Lotus Data Connection API, for use with LotusScript agent programs

  With LEI 7.0 for i5/OS, non-Domino data sources include Oracle, MS SQLServer, Sybase, and Informix, as well as IBM DB2/UDB, which was available in previous LEI releases.

  Access to IBM DB2/UDB is accomplished using the iSeries DB2 CLI; access to other data sources uses ODBC.

  For more details, refer to:

  http://www.ibm.com/servers/eserver/iseries/domino/related/lei.html

4.5.3 EAI/Application integration

The tools in this subcategory aid in the integration of enterprise applications. They include:

- WebSphere Information Integrator provides a strategic framework to help clients speed new application deployment and control IT costs. It gives companies real-time, integrated access to business information: structured and unstructured, public and private, and mainframe and distributed. The cornerstones of the framework include data and content federation, replication, event publishing, and enterprise search with WebSphere Information Integrator OmniFind™ Edition.

  WebSphere Information Integrator capabilities include:

  - Understanding Information: Automated data profiling and analysis to unlock the mystery of source data content and structure.
  - Cleansing Information: Data quality enhancement to identify, correct, match, standardize, and reconcile inaccurate or redundant data.
  - Transforming Information: Data transformation and delivery to get data of any complexity from any sources, format it as required, and deliver it to any targets, within or outside the enterprise, at the right time.
  - Federating Information: Information access and integration for diverse data and content as though it were a single resource, regardless of where the information resides.
  - Connecting Information: Consolidation, synchronization, and distribution across disparate databases.

  For more details, refer to:

  `http://www.ibm.com/software/data/integration/`

- WebSphere MQ delivers reliable integration for applications and Web services, allowing you to fully leverage your existing software and hardware investments, with a proven and trusted market leader.

  WebSphere MQ provides an award-winning messaging backbone for deploying your enterprise service bus (ESB) today as the connectivity layer of a service-orientated architecture (SOA).

  WebSphere MQ can increase business flexibility and help with regulatory compliance obligations. It offers increased transparency, reliability, and auditability of data movement compared to file transfer (FTP) based approaches.

  WebSphere MQ is easy to use, with Eclipse tooling that enables you to configure your WebSphere MQ network remotely, including WebSphere MQ for z/OS V6.0 deployments.

  WebSphere MQ features integrated support for Web services, helping you to swiftly bring reliability, visibility, and auditability to SOAP interactions.

  WebSphere MQ integrates virtually anything, supporting more than 80 platform configurations, including native z/OS support, with IBM and Business Partner offerings. It also integrates CICS, IMS™, DB2, .NET, and J2EE environments.

  WebSphere MQ supports both *de facto* interface MQI and industry standard JMS V1.1 interfaces, with integrated publish-and-subscribe support.

  WebSphere MQ supports secure Internet communication with industry standard Secure Sockets Layer (SSL). Extended Security Edition offers end-to-end governance. It also supports IPV6 and awarded Common Criteria certification.

  WebSphere MQ offers proven scalability, availability, and performance that grows with your needs.

For more details, refer to:

http://www.ibm.com/software/integration/wmq/

- WebSphere MQ Everyplace® Version 2.0 connects mobile and wireless applications with the enterprise using secure and dependable application messaging. It provides:
  - End-to-end connectivity for mobile applications: Provides the mobile transport for the IBM enterprise integration bus and connects seamlessly with WebSphere Business Integration offerings. Extends robust messaging to fragile mobile and wireless networks to address the problem of intermittent network connectivity.
  - Broad mobile device support: Supports a wide range of devices with a small, customizable footprint. Offers a choice of languages, APIs, and environments, including Java, C, JMS, and J2ME.
  - Robust mobile integration: Has once-only messaging, so transactions are not lost or duplicated between mobile applications. It also has peer-to-peer, synchronous, and asynchronous support, as well as rich encryption, non-repudiation, and authentication features.
  - Extensively customizable: You can configure rules to transmit during off-peak rates or at specific times. This tool is suitable for unmanaged networks. Message caching and compression features help lower communication costs. There is JMX™ support for increased systems management.

  For more details, refer to:

  http://www.ibm.com/software/integration/wmqe/

4.6 Tools to integrate business processes

The System i Developer Roadmap defines *Integrate business processes* as having systems and applications working together, connecting with suppliers and clients, to achieve efficiencies, better communication, and services. The subcategories in this step are:

- Business integration: Tools that aid in the integration of business processes.
- Content/Image management: Tools that allow existing or new applications to integrate with content/imaging systems for capture and management of content.
- Data synchronization: Tools that meet Uniform Code Council (UCCNet) mandates for synchronization of product item data.
- e-commerce: Tools that can be customized with minor effort to integrate a Web shopping cart type application with core business applications.
- EDI/XML: Electronic data interchange (EDI) tools for moving data between vendors in the supply chain.
- FAX: Tools that automate the integration of print output of existing applications with FAX interfaces.
- Programmable logic controller: Tools and software for interfacing with programmable logic controllers.
- Telephony: Tools that allow existing or new applications to integrate with telephone switches for inbound and outbound calling.
- Workflow: Tools that provide enablers to force an application to run in a specific sequence and may force specific users to complete process steps.

Business integration is the subcategories that applies to modernization and integration.

4.6.1 Business integration

Business integration consists of tools that aid in the integration of business processes. The IBM tools that fits into this subcategory include:

- WebSphere Business Integration Server Express: This product's enhancements help to improve business flexibility, while simplifying configuration and administration tasks.
  - Helps small and medium businesses (SMB) quickly and easily integrate their applications with a low total cost of ownership.
  - Based on the market leading IBM WebSphere Business Integration Server, the Express offering provides a comprehensive integration package.
  - Transforms existing applications running on iSeries to on demand applications.
  - Easy-to-use graphical tooling that maps business processes to underlying IT implementations with minimal necessary skills.
  - Improved business agility with rules-based business flows.
  - Fast time-to-value with process templates and easy connectivity to a wide range of applications using pre-packaged adapters.
  - Easy for partners to customize and create repeatable solutions.
  - Support for open standards, including Web services.
  - Runs on multiple platforms, including Windows, Linux, and iSeries.

  For more details, refer to:

  http://www.ibm.com/software/integration/wbiserverexpress/
- WebSphere Business Integration Server Express Plus: Comprehensive tooling to extend and modify pre-packaged process templates and create new processes:
  - Extended adapter availability (up to a maximum of five adapters).
  - Adapter Capacity Pack allows processes to quickly access data and transaction information from business applications.
  - Offers a suite of ten pre-packaged business application adapters that include adapters for SAP, JD Edwards, Oracle, Siebel, i2, Commerce, MetaSolv, QAD, Telecordia, and Peoplesoft.
  - Collaboration Capacity Pack Pre-built process templates enable rapid automation of business processes.
  - Application independent process templates that graphically define end-to-end processes with encapsulated business rules and integration.
  - Offers a suite of pre-packaged process templates to implement commonly use mid-market business processes, including Procurement, Customer Relationship Management, Order Management, and Human Resources.

  For more details, refer to:

  http://www.ibm.com/software/integration/wbiserverexpress/editions/plus/
- WebSphere Business Integration Server Foundation: Provides the following key capabilities that enable you to:
  - Extend and integrate your existing IT assets using a next generation integration platform optimized for building and deploying composite applications.
  - Maximize the return on your IT investments by creating easily reusable services out of your Web services, Java assets, back-end systems, and packaged applications.

- Improve your IT responsiveness by leveraging a service-oriented architecture to build modular applications that are designed to adapt quickly to change.
- Expand the reach of your existing systems using a broad portfolio of rich application and technology adapters.
- Maximize your developer productivity by quickly constructing new process-based applications using drag-and-drop development tools to visually coordinate the interactions between your software assets.
- Anticipate change by using business rules to embed adaptable business logic into your applications and business processes.
- Minimize your development, deployment, and administration costs by building on the industry-leading, industry-tested, and industry-supported WebSphere platform.
- Protect your infrastructure investments and minimize training costs by developing applications using industry-supported open standards.

For more details, refer to:

http://www.ibm.com/software/integration/wbisf/

5

Integrating System i with Microsoft .NET

Many System i clients are using Microsoft .NET servers as part of their information technology (IT) environment. This chapter introduces the ISV tools and IBM tools available to help independent software vendors (ISVs) and clients modernize and integrate System i applications with applications running on Microsoft Windows or .NET. We understand that some clients want to use a Windows or .NET solution to enhance their System i applications. However, we are not promoting a migration of applications from the System i platform to a .NET environment.

This chapter also provides a high-level description of Microsoft .NET and its architecture.

5.1 System i and .NET integration

The IBM System i has the client's interests at heart. Sometimes that means providing support for a competitor such as Microsoft and their products. IBM understands that you purchase the technology, hardware, and applications that fit your business needs regardless of whether the solution is provided by IBM or others. IBM also understands that you need an integrated IT environment where applications and data can be shared across operating environments to meet your needs and to create integrated business processes. To accommodate these diverse environments, IBM and ISVs provide tools to support the modernization System i applications and integration of System i applications with .NET.

Legal Notice:

The ISV tool descriptions provided in this chapter is taken from the Solution Connection Web site:

https://www.ibm.com/servers/solutions/finder/portal/search.jsp

Please review the "Legal Disclaimer" on page viii regarding ISV tool descriptions.

5.2 High level overview of .NET

.NET is a language-neutral environment for writing programs that can easily interoperate. The .NET programs run inside the .NET execution runtime rather than on a particular hardware or operating system platform. .NET is also the collective name given to various software components that are built on the .NET platform. The components that make up the .NET environment are referred to as the .NET Framework.

5.2.1 Architecture

The .NET Framework has two main components: the common language runtime and the unified .NET Framework class library.

- The *common language runtime* (CLR) is the foundation of the .NET Framework. It manages code at execution time, providing such core services as memory management, thread management, and remoting, which also enforces strict type safety and security. In fact, the concept of code management is one of the cornerstones of .NET architecture. Code that targets the runtime is known as *managed code*, and code that does not target the runtime is known as *unmanaged code*.

  The CLR manages memory, thread execution, code execution, code safety verification, compilation, and other system services. These features are intrinsic to the managed code that runs on the common language runtime.

  The CLR provides a runtime environment for .NET applications. The CLR provides a fundamental set of services that all programs can use. It can compile managed code once, then run on any CPU and operating system that supports the runtime. The CLR runs intermediate language, which is created from any .NET programming language, such as VB.NET and C#.

- The *class library*, the other main component of the .NET Framework, is a comprehensive, object-oriented collection of reusable types that you can use to develop applications ranging from traditional command-line or graphical user interface (GUI) applications to applications based on the latest innovations proved by ASP.NET, such as Web Forms and eXtensible Markup Language (XML) and Web services.

Typically, .NET applications use ADO.NET classes to access and manipulate database objects.

.NET programs are not compiled directly into executable code, but are compiled into an intermediary language known as Microsoft Intermediate Language (MSIL or IL). Later, at program execution, the CLR loads the code into the runtime environment and a just-in-time compiler (JIT) compiles the IL into native executable code. This native code is then executed by the runtime's execution engine.

The Microsoft .NET Framework is designed for the Windows operating systems. To run any .NET application, the client or server must have a runtime called the .NET *redistributable*, which is freely available from the Microsoft Web site. For configuring server-side applications, the recommendation is to use Windows 2000 Server or higher.

5.3 .NET integration

Clients may use various systems to operate their business applications. IBM System i platform recognizes the need to support a heterogeneous IT environment. .NET systems may be part of a client's environment. The System i Developer Roadmap has anticipated this need for integration. The *Create a modular architecture* step within the roadmap encompasses the separation of user presentation, business logic, and database access, thereby creating reusable application and database callable modules. This step has a subcategory called *.NET integration*, which identifies tools that provide integration between System i and .NET applications.

The System i Tools Innovation program has identified both IBM and IBM ServerProven ISV provided tools that enable .NET integration.

5.3.1 IBM ServerProven ISV tools for integration

The ISV tools in this subcategory enable integration between System i and .NET applications. The tools in this subcategory are listed in order by company:

- ASNA DataGate Component Suite, by ASNA, offers C# and VB.NET a robust .NET assembly that provides fast, reliable, and scalable access to iSeries physical and logical files. It also provides a high-speed program call, allowing C# and VB.NET programmers to call OS/400 program objects easily.

  C# and VB.NET offer superb facilities for connecting to databases through ADO.NET. Unfortunately, connecting to the iSeries through an ODBC or OLE DBconnection is often times slow and may not scale well. Despite recent improvements in SQL performance for the iSeries, OLE DB and ODBC do not offer the performance and robustness often required for transaction-based, high volume database access. This leaves C# and VB.NET programmers with the challenge of connecting their language to the iSeries to create enterprise-worthy applications. ASNA's DataGate Component Suite for .NET (DCS) offers the solution to this problem. DCS offers C# and VB.NET a robust .NET assembly that provides fast, reliable and scalable access to iSeries' physical and logical files, providing a high-speed program call and allowing C# and VB.NET programmers to easily call OS/400 program objects.

  For more details, refer to:

  `http://www2.asna.com/DataGate_Component_Suite.asp`

- ASNA DataGate for SQL Server, by ASNA, provides RPG programmers access to SQL Server 2000 through native RPG file input output (I/O) using familiar RPG operation codes, such as CHAIN and SETLL. AVR programmers will not need to learn SQL to get effective access to SQL Server—the skills they use today for AS/400 file I/O will work exactly the same way for SQL Server. And, the same AVR programs that also connect to SQL Server will seamlessly connect to the AS/400 and the ASNA Acceler8DB database for NT/2000 Servers and mobile computers. This allows AVR programmers to write one set of Web, wireless, and Windows applications that work concurrently with both the AS/400 and SQL Server.

  For more details, refer to:

  http://www2.asna.com/datagateinfo.asp

- ASNA Visual RPG (AVR) for .NET, by ASNA, is a Windows-based RPG compiler that compiles to 100% .NET Microsoft Intermediate Language assemblies. These assemblies run under Microsoft's .NET platform, with either traditional fat Windows client or browse-based user interfaces.

  AVR for .NET enables your programming teams to build sophisticated, feature-rich applications quickly. AVR for .NET employs a super-set of the RPG programming language your iSeries development team already knows. RPG programmers learn AVR for .NET quickly and easily. Less time learning means more time doing! AVR for .NET extends the life of your existing base of RPG source code and allows existing OS/400 program objects to be called from Windows- or browser-based applications. Because of its RPG roots, AVR for .NET substantially enhances the capabilities of your RPG programmers. For example, your RPG development team can quickly build industry standard Web Services with AVR for .NET. For both tangible assets (source code, program objects and dataflows) and intangible assets (your RPG programming teams), AVR for .NET lets you extend and preserve their combined value for your organization.

  AVR for .NET supports such industry standards as XML, XSL, SOAP, WSDL, and UDDI. Selecting tools that strongly embrace these standards is important, because you know you are not building proprietary, one-off solutions.

  For more details, refer to:

  http://www.smisupervisor.com/

- LANSA 2005, by LANSA, offers breakthrough application modernization, extension, and integration capabilities for IT development teams and software vendors on multiple platforms, including the IBM @server iSeries.

  LANSA 2005 is a powerful suite of application development and integration products that enables mid-sized organizations to overcome the complexity inherent in delivering tomorrow's applications. This release offers:

  – Enhanced and Extended Rapid Application Development Capability
  – Out-of-the-box support for Web services
  – One-click device support
  – Any-to-any integration
  – A broad array of solution options for clients

  What makes this unique from other offerings in the marketplace is that current IT staff can easily master LANSA 2005 to:

  – Assemble composite applications from existing systems and databases
  – Deploy to a browser or client/server n-tier solution
  – Run on their platform of choice

For more details, refer to:

http://www.lansa.com/products/lansa2005.htm

- LANSA Integrator, by LANSA, enables integration of Application-to-Application (A2A) and Business-to-Business (B2B) transactions through XML and Java services. LANSA Integrator allows bi-directional XML — and other data formats — to be exchanged between you and your trading partners, regardless of platform. It also enables integration of user-written Java services with LANSA, C, RPG, and COBOL applications.

  What can LANSA Integrator do?

  - Automate orders between a manufacturer and distributor by dynamically linking ERP systems.
  - Exchange information between ATMs and server-based banking systems.
  - Integrate a Java-based credit card application with an order entry system.
  - Send and receive XML transactions between suppliers and distributors.
  - Exchange data between a stand-alone Wireless device and the server.
  - Publish or utilize third-party Web services via SOAP.
  - Provide SOAP interfaces to your existing business functions.
  - Integrate heterogeneous CRM and back-office systems via XML over MQ Series.
  - Provide secure (digital certificates and password protected) PDF documents via e-mail for contract agreements.
  - SMS updates on the status of order or delivery transactions in real-time.
  - And many more practical applications.

  For more details, refer to:

  http://www.lansa.com/products/integratoroverview.htm

- centric, by looksoftware, provides direct access to the presentation, application, and database layers of your applications. Broad support for interoperability allows you to rapidly integrate them with other platforms and technologies, including .NET, Java, Windows, zSeries, and Linux.

  centric's programmatic integration support allows you to create reusable modules from your existing applications so you can benefit from Web services and SOA.

  Use centric's flexible support for heterogeneous access and new functionality to deliver composite applications. Assemble new solutions by reusing existing components and use new look's support for smart clients to deliver sophisticated user interfaces.

  centric can access information from multiple sources and applies your custom rules before distributing the information to the required destinations in real-time. In summary, centric provides:

  - Direct access to your 5250 and 3270 applications for presentation layer integration.
  - Remote Procedure Call (RPC) and Web services support provides powerful application layer integration.
  - Support for IBM Distributed Data Management (DDM) and Microsoft's ActiveX Data Object (ADO) lets you access databases including DB2, SQL Server, ADO, and Sybase on platforms like iSeries, zSeries, Linux, and Windows.

  For more details, refer to:

  http://www.looksoftware.com/prod_centric.htm

- Delphi/400, by SystemObjects Corp., is an integrated development environment using PASCAL to build Internet Server Application Programming Interface (ISAPI) dynamic language libraries (DLLs) or create ActiveX components to build your Internet applications. Can also be used to build, rapidly and easily, client/server applications accessing natively your physical and logical files. There is no Object Database Connectivity (ODBC) driver; you just need a Transmission Control Protocol Internet Protocol (TCP/IP) connection (commonly used today) or an Advanced Program to Program Communications (APPC) router.

  For more details, refer to:

  http://www.systemobjects.com/HomeDelphi400.html

5.3.2 IBM tools for integration

- DB2 Connect makes your company's host data directly available to your Personal Computer (PC) and local area network (LAN)-based workstations.

  It connects desktop and mobile device applications to your company's mainframe and minicomputer host databases, leveraging your enterprise information no matter where it is!

  DB2 Connect provides the application enablement and robust, highly scalable communication infrastructure for connecting Web, Windows, UNIX, Linux, and mobile applications to z/OS and AS/400 data.

  Features at a glance:

  - Seamlessly connects popular desktop applications to S/390 and AS/400 data.
  - Enables fast, secure access to existing data through intranets, extranets, or the public Internet.
  - Integrates new Web-based applications with existing core business applications.
  - Provides the performance, scalability, reliability, and availability needed for the most demanding e-commerce, customer relationship management (CRM), business intelligence (BI), and enterprise resource planning (ERP) applications.
  - Provides extensive application programming tools for developing client-server and Web applications using industry standard application program interfaces (APIs), such as Open Database Connectivity (ODBC), ActiveX Data Object (ADO), Object Linking & Embedding Data Base (OLE DB), Java Database Connectivity (JDBC), SQLJ, DB2 CLI, and Embedded SQL
  - Allows you to build new Internet applications and extend existing applications such as data warehousing, data mining, Online Transaction Processing (OLTP), and Online Analytical Processing (OLAP) to the Web.
  - Integrates with both Java and Microsoft models for developing new Web-based applications.
  - Energizes mobile PC users and users of the new pervasive computing devices with reliable, up-to-date data from S/390 and AS/400 database servers.

  For more details, refer to:

  http://www.ibm.com/software/data/db2/db2connect/

- DB2 Connect Unlimited Edition for iSeries is a brand new offering for the DB2 Connect family targeted at iSeries. It is the industry-leading solution integrating iSeries data with client-server, Web, mobile, and Services Oriented Architecture (SOA) applications. It delivers unified application development, integrated data and pervasive data functionality to IBM @server iSeries clients. It has the following features:
  - Simplified Application Development for iSeries: Develop applications using dominant application frameworks: Microsoft .NET, Java 2 Platform Enterprise Edition (J2EE), or service-oriented architecture (SOA).
  - Program in Java, Visual Basic, .NET, C#, PHP, C, or C++.
  - Improves programmer productivity with DB2 add-ins for Visual Studio® .NET and Eclipse based tools, such as WebSphere Studio and Rational Application Developer.
  - Embrace new technologies and extend your applications to Web Services and SOA.
  - Use industry standard APIs: ADO.NET, ODBC, OLE DB, DB2 CLI, JDBC, SQLJ, and Embedded SQL.

  Data Integration for iSeries: With a single SQL request, you can join DB2 UDB iSeries data to DB2 tables from another or multiple iSeries servers or partitions, DB2 databases on Windows, UNIX, and Linux servers, Informix Dynamic Server (IDS), DB2 data on zSeries mainframes when coupled with another DB2 Connect offering, and non-IBM data sources like Oracle, SQL Server, Sybase, when coupled with WebSphere Information Integrator.

  You can also extend application data to mobile devices and capture transactions executed on mobile devices to return data to the application.

  Licensing Metrics: Managed Processors: Charging for this program is based on the number of processors allocated to the data source running on i5/OS or OS/400 operating systems. Charges for program are not based on the number of processors attached or available to the DB2 Connect Unlimited Edition for iSeries itself. Unlimited users are permitted.

  The package includes:
  - DB2 Connect Unlimited Edition for iSeries
  - DB2 Connect Personal Edition
  - DB2 Administration Client
  - DB2 Run-Time Client
  - DB2 Run-Time Client Lite for Windows
  - IBM Developer Kit, Java Technology Edition
  - DB2 Embedded Application Server
  - DB2 Mobility on Demand
  - DB2 Information Center Documentation
  - DB2 PDF Documentation
  - WebSphere MQ Series
  - WebSphere Studio Site Developer

  Runs on server platforms (32-bit and 64-bit): Windows, AIX, HP-UX, HP UX IA64, Solaris, Linux Intel, Linux for iSeries and pSeries®, Linux for S/390 31-bit, and Linux for zSeries 64-bit.

  For more details, refer to:

  http://www.ibm.com/software/data/db2/db2connect/edition-uei.html

- iSeries Access for Windows (called "Client Access Express for Windows" in V5R1 and earlier releases) delivers TCP/IP connectivity to users running a variety of Microsoft Windows operating systems. iSeries Access for Windows offers an all-inclusive client solution for accessing and using resources from your Windows desktop. It includes 5250 emulation, access to DB2 Universal Database (UDB) for iSeries through its Data Transfer, and utilizes iSeries NetServer for working with the OS/400 Integrated File System and printers. It also has a variety of middleware for using and developing client applications to access OS/400 resources, and iSeries Navigator, the OS/400 GUI, for administering iSeries and AS/400 servers.

  The use of PC5250 and Data Transfer in iSeries Access for Windows and Client Access Express requires an iSeries Access Family (5722-XW1) license.

  For more details, refer to:

  http://www.ibm.com/servers/eserver/iseries/access/windows/

5.3.3 Applications using ADO.NET

Applications that use ADO .NET with the System i platform can work with several different .NET providers. The redbook *Integrating DB2 Universal Database for iSeries with Microsoft ADO .NET*, SG24-6440 shows clients how to use ADO.NET effectively to harness the power of the DB2 UDB for iSeries. It shows examples, best practices, pitfalls, and comparisons between the different ADO.NET data providers. The book can be found at the ITSO Web site:

http://www.redbooks.ibm.com/abstracts/sg246440.html?Open

6

Leveraging System i and xSeries integration to deploy Windows 2003 applications

This chapter introduces IBM System i, xSeries, and BladeCenter offerings to support deploying Windows 2003 applications and tools in an integrated System i infrastructure with the following offerings:

- The Integrated xSeries Server
- xSeries system integration with System i via the Integrated xSeries Adapter
- xSeries and BladeCenter integration via the new System i5 iSCSI Host Bus Adapters, available on POWER5 systems running i5/OS V5R4

6.1 System i5 integrated xSeries solutions

Many businesses manage heterogeneous environments, including Microsoft Windows and Linux applications running on Intel processor-based servers, and have core applications running in i5/OS on the System i platform. To meet your business needs, you may require applications and services that run on these various operating systems. However, this mix of servers may grow into a challenging IT environment that is difficult to manage and maintain.

The System i family offers solutions that provide flexible, cost-effective alternatives to managing a complex IT environment with multiple disparate servers and operating systems. These solutions include:

- The Integrated xSeries Server (IXS)
- xSeries systems attached via the Integrated xSeries Adapter (IXA)
- xSeries systems or BladeCenter attached to System i5 via new Internet Small Computer System Interface (iSCSI) Host Bus Adapters (HBA)

These integrated xSeries and BladeCenter offerings deliver tightly integrated, easy to manage Intel processor-based solutions, providing a cost effective and efficient alternative to running Windows Server 2003 or Linux applications on multiple stand-alone servers.

The difference between these solutions is how the System i and xSeries hardware integration is accomplished. Each solution is designed to meet different requirements:

- An IXS is an Intel processor-based server installed within System i platform.
- An IXA is a high-speed link (HSL) bus adapter plugged into a supported xSeries server. The xSeries server appears as an HSL attached expansion unit of the System i5.

  IXA attached xSeries systems are standard xSeries server models, containing processors, memory, and expansion cards, but no disks. All the disk space is virtual, physically located in the System i5, and managed by i5/OS in the same way as for the IXS.
- New iSCSI Host Bus Adapters for System i5 and xSeries will attach diskless xSeries and blade servers to System i5 using industry-standard Ethernet networking technology. iSCSI HBAs will be installed in the System i platform, as well as each participating xSeries server, and on each participating IBM BladeCenter blade server. Standard 1 gigabit per second (Gbps) Ethernet cables and switches will be used to connect the HBAs.

For the latest information about System i integration with Windows servers, refer to:

`http://www.ibm.com/servers/eserver/iseries/integratedxseries/`

For the latest information about System i integration with Linux, refer to:

`http://www.ibm.com/servers/eserver/iseries/linux/`

6.2 Key advantages to System i and xSeries integration

The advantages to using xSeries and System i integration to deploy Windows applications are:

- A better way to do Windows: Designed for local consolidation and integration of Intel processor-based servers and storage, this integration can also provide centralized management of i5/OS and Windows Server 2003 applications and data.
- Integrated operations: Allows administrators to manage both i5/OS and integrated xSeries systems using iSeries Navigator's graphical user interface. Administrators can manage

servers, users, and storage using this centralized interface or by using an i5/OS command interface. Its features include:

  - Centralized, graphical server management via iSeries Navigator.
  - Synchronized security by having i5/OS and Windows Server 2003 user IDs and passwords integrated and centralized.
  - Consolidated backup can provide consolidated i5/OS, Windows, and Linux backup to System i5 tape drives, allowing businesses to more fully leverage hardware and IT support resources.

- Streamlined communications: System i applications and DB2 Universal Database (UDB) data may integrate with Windows applications and data on integrated xSeries via Virtual Ethernet connections that can easily:
  - Isolate server to server traffic.
  - Provide more reliable and secure communications between servers.
  - Reduce external network traffic.
- Exceptional storage management: System i has a unique storage architecture that can provide more flexibility than conventional stand-alone Windows servers implementations. You can consolidate all of your i5/OS, Windows, and Linux storage and backup centrally, utilizing i5/OS virtual storage and storage management, allowing your business to more fully leverage hardware and IT support resources. For example, one tape device can perform automated backup for the entire system environment.
- Flexible and reliable server deployment: These solutions and i5/OS storage virtualization provide innovative options that can enable you to enhance the reliability and recoverability of your Windows server™ environment. If a server fails, you can quickly and easily switch the server's storage spaces to another *hot spare* xSeries or blade server.

6.3 Introducing the Integrated xSeries Server

The Integrated xSeries Server (IXS) is an Intel processor-based server on a Peripheral Component Interconnect (PCI) based interface card that plugs into a System i5. The IXS takes advantage of the i5/OS system management, communication, and virtual storage resources, while still operating as though it were a stand-alone Windows server.

These are the specifications of the most current Integrated xSeries Server (IXS), the 2.0 GHz Pentium® M Integrated xSeries Server, which includes:

- A 2.0 GHz Intel Pentium M processor with 2 MB L2 cache.
- A 400 MHz front side bus (FSB).
- An on-board dual port 10/100/1000 Mbps Ethernet controller.
- Two Universal Serial Bus (USB) ports are available for connection of various devices, including printers.
- Two memory slots supporting 512 MB and 1GB ECC DDR memory for up to 2 GB total memory.
- Support for headless operation when running Windows Server 2003.
- Requires a separate input output processor (IOP) card, which is included with features #4811, #4812, and #4813.
- Because of its low power requirements and dense packaging, it can be installed inside the system unit or input/output (I/O) towers of the System i5 platform.

You can fit four IXS in four Electronic Industries Association (EIA) units of a 19-inch rack, when the #4812 IXS is used in conjunction with two #5790 expansion units.

The 2.0 GHz Pentium M Integrated xSeries Server requires i5/OS V5R3 or later and is supported in selected System i models, including the 810, 825, 870, 890, 520, 550, 570, and 595.

This IXS supports Microsoft Windows Server 2003.

For more details on the IXS, refer to:

http://www.ibm.com/servers/eserver/iseries/integratedxseries/ixs_overview.html

6.4 Introducing the Integrated xSeries Adapter

IBM enables direct attachment of 2-way, 4-way, or 8-way SMP IBM @server xSeries servers via the High Speed Link (RIO/HSL) bus to the System i5 to support Windows and Linux applications running on an xSeries. This integration is accomplished using an Integrated xSeries Adapter (IXA) for each xSeries and provides the same systems management, virtual storage, virtual networking, and tape sharing features of the Integrated xSeries Server.

The benefits of the Integrated xSeries Adapter are:

- Provides flexible virtual storage for Windows or Linux xSeries systems
- Delivers heterogeneous application solutions with one offering
- Consolidates up to 57 direct attached xSeries servers on the largest System i5 model
- Can enhance recovery with hot spare technology and improve system stability with a consistent implementation
- Can lower the cost of user administration by synchronizing i5/OS and Windows profiles and passwords
- Can reduce operations costs through integrated i5/OS and Windows server management using iSeries Navigator
- Can consolidate i5/OS, Windows and Linux backup to System i5 tape

The IXA is a PCI-based interface card that installs inside of selected xSeries server models. The card provides a 1 Gbps High Speed Link to a System i5, allowing for centralized storage, integrated operations, and system management, allowing the deployment of greater Intel processing power while taking advantage of the latest IBM X-Architecture™ innovations. Each xSeries server has its own processors, memory, and Integrated xSeries Server while sharing the disk, tape, DVD, and systems management resources of the System i platform.

For more details on Integrated xSeries Adapter, refer to

http://www.ibm.com/servers/eserver/iseries/integratedxseries/ixa_overview.html

6.5 Introducing System i, xSeries, and BladeCenter integration via iSCSI

With i5/OS V5R4, the System i5 iSCSI Host Bus Adapters will enable selected xSeries servers and BladeCenter offerings to be integrated to System i platform via industry-standard iSCSI technology. Using an iSCSI Host Bus Adapter in each xSeries, the blade server and System i5 will enable connectivity over 1 Gbps Ethernet switches and cables. Utilizing industry-standard network components should enable lower cost and more flexible

connections to the System i5 platform from a wider range of xSeries servers and, for the first time, will enable System i integration with IBM BladeCenter. iSCSI is an Internet protocol-based networking standard for linking servers to storage over local area networks (LANs).

6.6 IBM System i5, xSeries, and BladeCenter integration advantages

Deploying Windows Server 2003 applications on xSeries or blade servers integrated with the System i platform can provide the following advantages over multiple stand-alone servers:

- An integrated xSeries running Windows uses System i5 virtual storage, which can centralize all Windows disk in a single RAID 5 protected pool of physical disks managed by i5/OS.
- You can utilize high-speed System i tape drives for Windows backups and incorporate your Windows Server backups as part of your i5/OS backup process.
- Utilizing System i virtual storage can allow you to recover a failed server much faster and easier than with typical file level recovery from Windows.
- Integrated xSeries implicitly takes advantage of superior data protection schemes that exist in i5/OS, such as RAID or drive mirroring.
- Typical integrated xSeries configurations have storage space data spread across more System i disk drives than might be typically configured in stand-alone (non-integrated) Windows server installations. This can frequently provide better peak disk input output capacity, since each server is not constrained to a few dedicated drives.
- You can add additional virtual disk storage to integrated xSeries systems without shutting down the server.
- You can gain access to i5/OS DB2 UDB data through an enhanced Open Database Connectivity (ODBC) device driver using iSeries Access. This device driver enables server-to-server applications between integrated servers and i5/OS.
- You have the ability to use an integrated xSeries system as a second tier in a three-tier client/server application, utilizing virtual Ethernet networking to communicate between the xSeries and System i5. Virtual networking does not require additional LAN hardware and easily provides communications between System i5 logical partitions, IXSs, IXAs, and iSCSI HBAs.

These solutions offer simplified administration:

- User ID and passwords can be easily administered from i5/OS. You can create users and groups and enroll them from i5/OS to integrated xSeries systems running Windows. This makes synchronizing and updating passwords between i5/OS and Windows easy.
- Your complete IT infrastructure can be less complicated thanks to the integration of user administration function, server management, storage management, networking, and backup and recovery processes between the i5/OS and Microsoft Windows environments. You can save your Windows data on the same media as other i5/OS data and restore individual files as well as i5/OS objects.
- If an integrated xSeries were to experience a hardware failure, you can quickly and easily switch the server's configuration to another hot spare xSeries server or IBM BladeCenter server without restarting your System i5. This may reduce the overall number of PC servers needed to provide increased availability.
- One hot spare xSeries or blade server may be used as a standby to protect multiple production servers.

Included in these solutions are remote management and problem analysis:

- You can sign on to i5/OS from a remote location and shut down or restart your integrated xSeries or blade server through iSeries Navigator.
- Since you can mirror integrated xSeries event log information to i5/OS, you can remotely analyze Microsoft Windows errors.

IBM BladeCenter blade servers attached via an iSCSI Host Bus Adapter can provide dense IBM BladeCenter packaging that can deliver additional savings in operations, power and cooling with industry-leading IBM integration for Intel processor-based servers.

For more details on integrated xSeries solutions, refer to the iSeries Information Center at:

`http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp`

and select **Integrated operating environment** → **Windows environment on iSeries** → **Concepts**.

7

System i integration using SOA and Web services

This chapter introduces service-oriented architecture (SOA) and Web services as a means to integrate System i applications with applications executing on other platforms, and integrate System i applications running in the same System i but on different operating systems or in different logical partitions (LPARs).

This chapter includes information about the IBM and ISV tools that support SOA and Web services and IBM application server products that support SOA and Web services on the System i.

7.1 Why tap into SOA and Web services?

A term quickly gaining momentum in companies today is *business ecosystem*. A ecosystem is an ecological community together with its environment, functioning as a single unit. A business ecosystem involves an ecological community consisting of:

- *Participants*: People such as clients, employees, business partners, suppliers, and organizational units (internal and external) that are involved with or in the business.
- *Business data and information*: Product, client, employee, company, financial, order (client and purchase), and shipment data are types of business data. Information is knowledge derived from or generalizations from business data.
- *Business processes*: Related activities that produce a business result for particular participant(s) or groups of participants.
- *Business applications:* Programs written in a variety of computer languages that perform business related activities, such as rendering data and information to users, managing and maintaining databases and data, and implementing validation and business logic specified by business policies and standards of operation.

In today's business environment, a business ecosystem often extends outside the corporate walls causing them to make data, information, and business applications available to participants in the business. This need places pressure on the business in two forms. One pressure is dealing with a *heterogeneous environment* consisting of a range of different systems, applications, and architectures based on technology of different ages and paradigms. The other pressure is dealing with a *continuously changing environment*:

- Internal pressures, such as policy changes, new products and evolving business strategies, can impact day to day operations.
- External pressures from business partners, suppliers, clients, and their needs affect how the business operates.

Handling and adapting to change has a direct impact on the business applications, business processes, and data and information maintained within the company.

How is a company and their IT environments supposed to deal with these pressures?

By fortifying their business ecosystem with the technology that gives them the flexibility to respond to the dynamics associated with these pressures. The technology must have the following characteristics:

- Loosely coupled
- Location transparent
- Protocol independent

The architecture that embody these characteristics is service-oriented architecture (SOA). Web services, an implementation of SOA, provides a distributed computing approach for integrating extremely heterogeneous applications over the Internet.

7.2 Introducing SOA

SOA is a component-based architecture that incorporates the notion of services. A component, in SOA, is an executable piece of code that provides a physical black-box encapsulation of related services. Its services can only be accessed through a consistent, published interface that includes an interaction standard. A service is generally implemented as a course-grained, discoverable software entity that exists as a single instance and

interacts with applications and other services through a loosely-coupled, message-based communication model.

With this architecture, the components (service consumer/requestors) do not care about the implementation details of the service they are communicating with because the underlying infrastructure makes the appropriate choices on behalf of the requestor. The infrastructure hides as many of the technical details as possible from a requestor. In particular, technical specificities from different implementations, such as J2EE or .NET, should not affect the SOA users. SOA also allows you to substitute a different service implementation if one is available with better quality of service characteristics.

SOA is described as the blueprint for IT infrastructure of the future. SOA extends the Web services value proposition by providing guidance on how enterprise IT infrastructure should be architected using the services.

A service-oriented architecture can be adopted at four different levels. They are:

- *Implementing Individual Web Services*: Creating services from tasks contained in new or existing applications.
- *Service-Oriented Integration of Business Functions*: Integrating services across multiple applications inside and outside the enterprise for a business objective.
- *Enterprise Wide IT Transformation*: An architected implementation enabling integration across business functions throughout an enterprise.
- *On Demand Business Transformation*: Broad transformation of existing business models or the deployment of new business models.

7.2.1 Benefits of SOA

With SOA, you can realize several benefits to help your company deal with pressures on the business and your IT environment:

- Leverage existing assets.

  SOA provides a layer of abstraction that enables an organization to continue leveraging its investments in its existing IT by wrapping these existing assets as services that provide business functions. Organizations potentially can continue getting value out of existing resources instead of having to rebuild from scratch.

- Easier to integrate and manage complexity.

  The integration point in SOA is the service specification and not the implementation. This provides implementation transparency and minimizes the impact when infrastructure and implementation changes occur. By providing a service specification in front of existing resources and assets built on disparate systems, integration becomes more manageable since complexities are isolated. This fundamental characteristic becomes even more important as more businesses work together to create the value chain.

- More responsive and faster time-to-market.

  The ability to compose new services out of existing ones provides a distinct advantage to an organization that has to be agile to respond to dynamic business needs. Leveraging existing components and services reduces the time needed to go through the software development life cycle, which includes gathering requirements, performing design, development, and testing. The ability to reuse existing services leads to rapid development of new business services and allows an organization to respond quickly to changes and reduce the time-to-market.

- Reduce cost and increase reuse.

  With core business services exposed in a loosely coupled manner, they can be more easily used and combined based on business needs. This means less duplication of resources, and more potential for reuse, lowering IT costs.

- Be ready for what lies ahead.

  SOA allows businesses to be ready for the future. Business processes (comprised of a series of business services) can more easily be created, changed, and managed to meet the needs at that time. SOA provides the flexibility and responsiveness that is critical for businesses to survive and thrive.

That said, SOA is not a silver bullet and migration to SOA is not an easy task. It is important to take an incremental approach to migrating to SOA. This is accomplished by taking an appropriate subset of the business functions and migrating them in anticipation of a business need or as the strategic direction dictates.

7.3 Introducing Web Services

Web Services, based on a loosely coupled architecture, is becoming the platform for application integration and can be referred to as a fundamental building block in the move to integrated applications via the Internet. To be more specific, Web services are self-contained, self-describing, modular applications that can be published, located, and invoked over a network, generally the Internet. Let us break this statement down and examine these key features:

- Web services are self-contained.

  On the client side, no additional software is required. A programming language with eXtensible Markup Language (XML) and Hypertext Transfer Protocol (HTTP) client support, for example, is enough to get you started. On the server side, merely a Web server and a servlet engine are required.

- Web services are self-describing.

  The client and the server only cares about the format and content of request and response messages, implementing a loosely coupled application integration.

  The definition of the message format travels with the message. No external metadata repositories or code generation tools are required.

- Web services are modular.

  Web services are technology for deploying and providing access to business functions over the Web; J2EE, CORBA, .NET and other standards are technologies for implementing these Web services.

- Web services can be published, located, and invoked across the Web.

  The standards required to do so are:

  - *eXtensible Markup Language (XML)* is the markup language that underlies most of the specifications used for Web Services. XML is a generic language that can be used to describe any kind of content in a structured way, separated from its presentation to a specific device.
  - *Simple Object Access Protocol (SOAP)* is an XML-based network and transport programming language and platform neutral protocol that allows a client to call a remote service.

- *Universal Description, Discovery, and Integration (UDDI)* is both a client-side API and a SOAP-based server implementation that can be used to store and retrieve information about service providers and Web services.
- *Web Services Description Language (WSDL)* is an XML-based interface and implementation description language. The service provider uses a WSDL document in order to specify the operations a Web service provides, as well as the parameters and data types of those operations. A WSDL document also contains the service access information.

- Web services are language independent and interoperable.

  The interaction between a service provider and a service requestor is designed to be completely platform and language independent. This interaction requires a WSDL document to define the interface and describe the service, along with a network protocol (usually HTTP). Because the service provider and the service requestor have no idea what platforms or languages the other is using, interoperability is a given.

- Web services are inherently open and standards based.

  XML and HTTP are the technical foundation for Web services. A large part of the Web service technology has been built using open source projects. Therefore, vendor independence and interoperability are realistic goals.

- Web services are dynamic.

  With UDDI and WSDL, the Web service description and discovery can be automated, helping to bring a dynamic e-business to reality.

  Using these principles, you can implement Web services without having any knowledge of the service consumers (requestors), and visa versa. This allows businesses to establish new partnerships easily and dynamically.

- Web services are composable.

  Simple Web services can be aggregated into more complex ones, either using workflow techniques or by calling lower-layer Web services from a Web service implementation.

Web service components

In the Web services world, there are providers that create and publish Web services, requestors that find and invoke Web services, and registries where Web services are published. The basic steps are:

1. Create a Web service and define its interfaces and invocation methods.
2. Publish the Web service to one or more intranet and Internet repositories for potential users to locate.
3. Locate the Web service to be invoked by the potential users.
4. Invoke the Web service in order to use it.
5. Unpublish any Web services that are no longer available or needed.

These steps are shown in Figure 7-1.

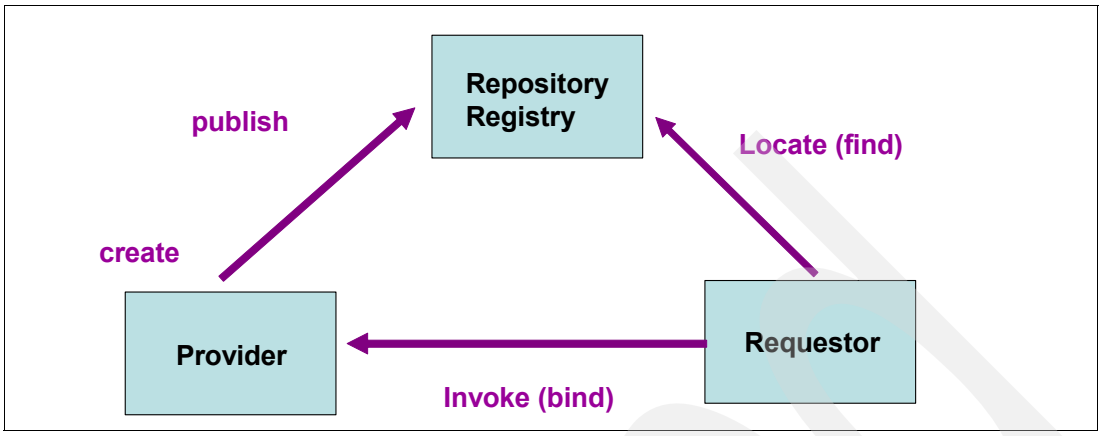


Figure 7-1 Web service components

Web service roles

Each component associated with a Web service plays an important role. The Web service provider creates the Web service and installs it on an application server. The Web service requestor writes the client application that invokes the Web service. The Web service broker runs a UDDI Registry where providers publish their Web services and requestors find the Web services.

SOAP is the protocol to invoke a Web service, and it is the protocol that can be used to publish and locate Web services in the UDDI Registry. The registry can also be accessed from a Web browser.

The Web services roles are shown in Figure 7-2.

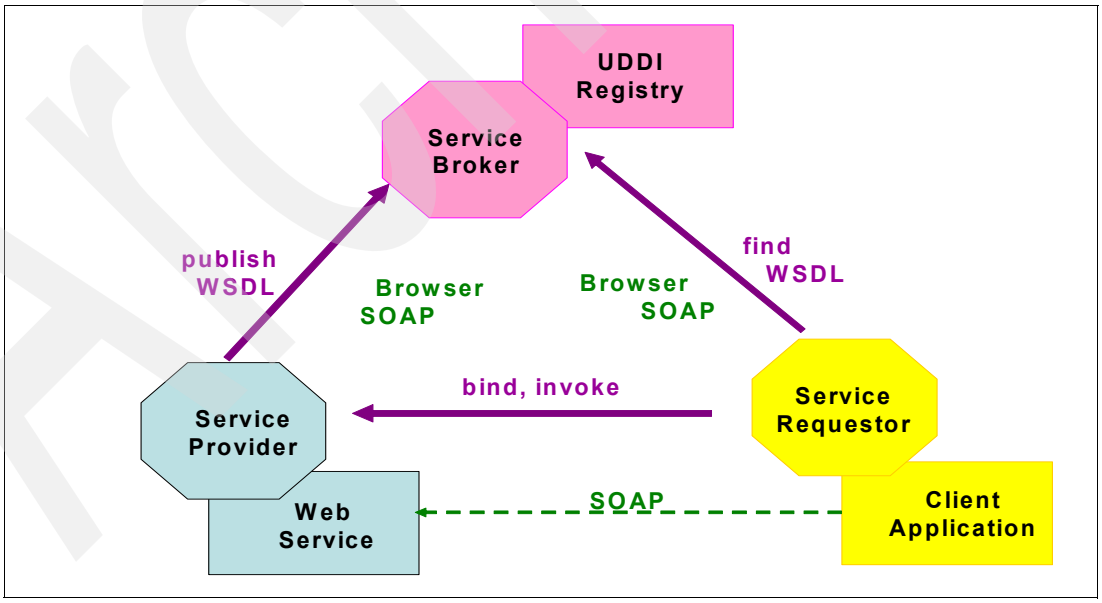


Figure 7-2 Web service roles

7.3.1 Web Services Interoperability Organization

Web services are a relatively new technology, with Web services standards continuing to be refined and developed. IBM and Microsoft are strong supporters of the Web Services Interoperability Organization's (WS-I) efforts to make building solutions using software from different suppliers a reality. The Web Services Interoperability Organization is an open, industry consortium of about 150 companies, representing such diverse industries as automotive, telecommunications, travel, and the computer industry. It is chartered to:

- Promote Web services interoperability across platforms, operating systems, and programming languages with the use of generic protocols for interoperable exchange of messages between services.
- Encourage Web services adoption.
- Accelerate deployment by providing guidance, best practices, and other resources for developing interoperable Web services.

For more details on WS-I, refer to:

http://www.ws-i.org/

It is important to point out that Web services are not the only technology that can be used to implement SOA. Many organization have successfully implemented SOA using other technologies. Web services have also been used by others to implement architectures that are not service oriented.

For more information about SOA and Web services, refer to:

http://www.ibm.com/software/solutions/webservices/resources.html

7.4 Tools and products for SOA and Web services

IBM and ISVs provide various tools and products supporting SOA and Web services for the System i5 platform.

7.4.1 IBM tools for creating Web services and promoting SOA

Listed below are the latest version of the IBM tools for System i that support Web services.

- WebSphere Development Studio for iSeries V5R4

  IBM WebSphere Development Studio for iSeries V5R4 is a comprehensive suite of application development (AD) tools for both e-business and i5/OS server development. This suite of tools contains server and workstation components that are optimized for i5/OS development. You can use WebSphere Development Studio for iSeries to create new e-business applications and to quickly and easily convert existing business applications that run on WebSphere Application Server.

  WebSphere Development Studio contains both the server and workstation tools. The workstation tools, Development Studio Client for iSeries, Version 6.0.1, is an entitlement of WebSphere Development Studio.

  For information about this product and previous versions, refer to:

  http://www.ibm.com/software/awdtools/wds400/

- WebSphere Development Studio Client for iSeries V6.0.1

  IBM WebSphere Development Studio Client for iSeries (Development Studio Client) V6.0.1 inherits and extends Rational Web Developer (RWD) V6.0.1 to deliver an integrated development environment (IDE) and tools for developing Java, Web, Web services, client/server, and i5/OS server applications, in languages like RPG and COBOL. The i5/OS enhancements to Development Studio Client V6.0 make it easy to create, test, deploy, and maintain sophisticated e-business applications with little Java, Web, or Web-service programming.

  A new extension to the Web Service Wizard is available to create Web services from ILE RPG or ILE COBOL programs in one step, making it easier to create SOA applications.

  For information about this product and previous versions, refer to:

  http://www.ibm.com/software/awdtools/wdt400/

- WebSphere Development Studio Client Advanced Edition V6.0.1

  WebSphere Development Studio Client Advanced Edition for iSeries V6.01 includes the functions found in WebSphere Development Studio Client for iSeries and has additional capabilities, such as:

  – All the capabilities in IBM Rational Application Developer for WebSphere Software V6.0.1, including tools to help accelerate the development of well designed, scalable, sophisticated, and fully J2EE-compliant Java applications.

  – The Log and Trace Analyzer consolidates i5/OS, Web, and WebFacing messages for easier problem determination of composite (mixed workload) applications.

  – The IBM WebFacing Tool has added support for Cascading Style Sheets-Positioning (CCS-P) in WebSphere Development Studio Client Advanced Edition for iSeries V6.0.1. This support allows the DDS fields on the Web-enabled interface to be repositioned, unconstrained by the boundaries of the original 5250 area, and offers an almost unlimited ability to customize the Web-enabled interface.

  For information about this product and previous versions, refer to:

  http://www.ibm.com/software/awdtools/wdt400/about/wdscAE.html

Introducing Web Services Client for C++

A Web service consists of one or more methods that share a common point of reference, and that can synchronously communicate, using Simple Object Access Protocol (SOAP) protocols, with other similarly enabled applications.

IBM Web Services Client for C++ (WSCC) provides a set of libraries and Java tools that enable you to build C++ Web service client applications from existing Web Service Description Language (WSDL) files. These applications are able to communicate over Hypertext Transfer Protocol (HTTP) with other applications that are configured in a similar way, using Transmission Control Protocol/internet Protocol (TCP/IP) with SOAP protocols.

WSCC has the following capabilities:

- Support for Web Services Description Language (WSDL) - document literal only
- Supports Web Services Invocation (WSI) 1.0 basic profile compliance
- Support for Secure Sockets Layer (SSL)
- Java API for XML-based remote procedure call (JAX-RPC) style implementation

How Web Services Client for C++ works

Web services are based on files called WSDLs, which are XML files containing all the information relating to services that are available at a particular location on the Internet. At their simplest level, WSDLs describe request/response message pairs in detail, and contain everything relevant to the service.

A Java program, WSDL2Ws, which is part of the Web Services Client for C++ package, is used to turn the WSDL into a suite of C++ stubs and data objects that you can call and pass information to, and that request information from the server and then wait for the corresponding reply before passing the response data objects back to the client. The stubs hide the Internet communication from the application writer. All you need to know is the name of the service, the method it contains, and the structure of any data objects that are passed.

The most common use of Web Services Client for C++ is to create a WSDL source file that describes the communication between the client and server, and then uses the WSDL2Ws tool to generate stubs that you can use to communicate with the Web service server.

For more detailed explanations and examples, see the docs sub-directory in the install directory for Web Services Client for C++, which is /QIBM/ProdData/xmltoolkit/wscc-1.0-OS400.

7.4.2 IBM Application servers

IBM provides a variety of application servers, allowing you to select the application server you need for your IT environment and particular business needs. The application servers are used to deploy and manage server-side Java applications.

These applications can range from simple Web sites to powerful e-business solutions. Versions 4 and later of WebSphere Application Server are fully compliant with the Java 2 Platform, Enterprise Edition (J2EE) specification.

The i5/OS V5R4 operating system supports these WebSphere Application Server for OS/400 and WebSphere Application Server for iSeries products:

- WebSphere Application Server V6 for OS/400

  Version 6 provides more consistency in the WebSphere Application Server family from top to bottom, including the Express version. Such features include support for J2EE 1.4 across the family, which makes it easier to develop and deploy applications using industry standard tools, and support for the latest Web Services standards, making it easier to integrate applications inside the enterprise as well as externally with clients, partners, and suppliers.

- WebSphere Application Server V5.1 for iSeries

  Version 5.1 supports Java servlets, JSP files, XML, and enterprise beans. The Network Deployment option provides centralized administration for clustered application servers and supports workload balancing and advanced Web services. This documentation applies to WebSphere Application Server V5.1 running on the V5R2, V5R3, and V5R4 operating systems.

- WebSphere Application Server V5 for iSeries

  Version 5 supports Java servlets, JSP files, XML, and enterprise beans. The Network Deployment option provides centralized administration for clustered application servers and supports workload balancing and advanced Web services. This documentation applies to WebSphere Application Server V5 running on the V5R2 and V5R3 operating systems. The V5R4 operating system is supported only if you are running the IBM WebSphere Portal Enable, IBM Workplace Services Express, or IBM Workplace Collaboration Services applications.

- WebSphere Application Server Advanced Single Server Edition V4 for iSeries

  Version 4 Advanced Single Server Edition that supports Java servlets, JavaServer Pages (JSP) files, XML, and enterprise beans.

- WebSphere Application Server Advanced Edition V4 for iSeries

  Version 4 Advanced Edition offers the functionality of Advanced Single Server Edition, and it supports multiple machine topologies, advanced security functions, and workload.

The WebSphere Application Server - Express products are very popular with ISVs and clients. They are:

- WebSphere Application Server - Express V6.0 for OS/400

  WebSphere Application Server - Express V6.0 for OS/400 is shipped as a licensed program product (LPP). It provides support for Java servlets, JavaServer Pages (JSP), Java Message Service (JMS), and Enterprise JavaBean (EJB), and core Web Services standards like XML, SOAP, WSDL, and WSIF for developing dynamic e-business solutions.

- WebSphere Application Server - Express for iSeries V5.1

  WebSphere Application Server - Express for iSeries is a low-cost, easy to use, out-of-the box solution that supports simple, dynamic Web sites based on the Java Servlet, JSPs, and Web Services technologies.

- WebSphere Application Server - Express for iSeries V5.0

  WebSphere Application Server - Express for iSeries is a low-cost, easy to use, out-of-the box solution that supports simple, dynamic Web sites based on the Java Servlet, JSPs, and Web Services technologies.

For general information about WebSphere Application Server products, refer to:

`http://www.ibm.com/software/webservers/appserv/was/`

For WebSphere Application Server for OS/400 product information, refer to:

`http://publib.boulder.ibm.com/infocenter/wsdoc400/index.jsp`

7.4.3 IBM ServerProven ISV tools for Web Services and SOA

The System i Developer Roadmap *Create a modular architecture* step has two subcategories with tools for SOA support:

- Business rule logic extraction for SOA
- SOA framework tools

Various ISVs have tools that provide support for Web services.

Legal Notice:

The ISV tool descriptions provided in this chapter is taken from the Solution Connection Web site:

https://www.ibm.com/servers/solutions/finder/portal/search.jsp

Please review the “Legal Disclaimer” on page viii regarding ISV tool descriptions.

Business rule logic extraction for SOA tools

This subcategory includes tools to extract business rule logic from existing interactive RPG/COBOL programs and turn this logic into new components for deployment in SOA environments. The ISV tools included in this subcategory are (in alphabetical order by company name):

- ARCAD-Observer, by ARCAD Software, gives you an instant, overall, and complete view of your information system, based on a repository, and powerful cross-reference tools with a user-friendly graphical interface. Your technical documentation is automatically generated and customizable to internal/external standards, which extends the lifetime of your information system. ARCAD-Observer is an invaluable tool in application re-engineering, as it reveals the internal architecture of your applications, and extracts the business rules from existing code. Its powerful impact analysis features bring major productivity gains to maintenance tasks, as the affected areas of code are exhaustively identified down to the source-line level. ARCAD-Observer also supports audit requirements, providing comprehensive and fully customizable retro-documentation, covering both detailed program structure, flowcharts, program calling chain, I/O previews, I/O diagrams, application workflow diagrams, database relationship diagrams, DDL scripts, cross-references, field directory, modified fields (by file), user functions, referenced message IDs, file usage diagram, and dependent files. Once the documentation has been generated in HTML format, you can export the resulting documentation to your intranet to be shared by a wide range of users (development, QA, or support staff, for example). These users have no need for an ARCAD-Observer licence, or any prior programming knowledge.

  For more details, refer to:

  http://www.arcadsoftware.com/produs_observer.htm

- X-Analysis, by Databorough, is a full cycle development tool kit, and world leader in iSeries application retro-documentation. It will extract business rules from your RPG/LE, with a full data model, move you to Java, and supply you with a Web deployable UI. It will also give you complete and instant graphical documentation of what the application is supposed to do, and supply you with a full test environment with data rollback ability, all done programmatically. Whether you just want to document your entire system from the early 80s, or deploy that same product on the next generation of IBM servers, X-Analysis is the tool kit that you need. Its features include:
  - Reverse engineers data models.
  - RPG/COBOL/Java cross-referenced together.
  - Views RPG as pseudo code.
  - Documents business rule logic.
  - Generates business rule server programs from existing code.
  - Reverse engineers JSP/JSF/ASP Web UI from existing programs.
  - Converts existing I/O into Java/SQL.
  - Integrated data analysis.

- Documents your entire system instantly and automatically.
- Plugs into WDSC with new Web projects from converted components.
- Integrated Data Analysis.
- Exports to XMI, DDL, Microsoft Word, and Visio.

For more details, refer to:

http://www.databorough.com/

- SMI SuperVisor, by Software Management, Inc., is used to interrogate the operating system and extract object attributes and system information. This data is stored into a common format that can be used to drive further processing. This analysis can be scoped across several systems. Because the stored data can be used to drive additional processing, iterative or nested analyses can be performed and corrective actions can be automated.

  SuperVisor Major Components include:

  - Systems analysis.
  - Cross-reference.
  - On-Line object analysis.
  - Source Management.
  - Test data management.
  - Security analysis and management.

  For more details, refer to:

  http://www.smisupervisor.com/

SOA framework tools

The SOA framework tools provide a framework used to create and maintain modular applications characterized with full separation of business logic, database, and presentation layers. Many of these tools are also capable of creating Web services. The ISV tools in this subcategory are:

- Strategi Web Services, by ADVANCED BusinessLink Corp., enables firms to create industry standard interfaces for their extensive collection of OS/400 development code. The result is a simple way to allow the OS/400 'silo' to function in a multiapplication and multi-platform environment. All developers use the tools of their choice; OS/400 programmers might use RPG and PDM while others might leverage Java and Eclipse, and the PC based group might use the drag-and-drop tools of Visual Studio .NET.

  The i5 is integrally linked to other development platforms in a more robust manner than ever before as a result of Strategi WebServices

  For more details, refer to:

  http://www.businesslink.com/product/strategi/webservices/homepage.htm

- ProGen WebSmart, by Business Computer Design, is a fast and easy to use PC based iSeries Web and wireless development tool. You can quickly and automatically produce dynamic HTML CGI programs in ILE RPG or Java servlets, from one effort. You can also develop using the PC based design tool, which integrates seamlessly with your database files. Wizards, templates, and cascading style sheets make development fast and easy. Generated applications run at optimal speed with minimal system resources. the tool is customizable to minimize repetitive programming, uses existing code logic, and uses your corporate standards. It is easy to learn and implement. You can develop and run programs in the first hour. No additional OS/400 or third-party Web software is needed; it uses a standard HTTP server, either the original HTTP Server or HTTP Server (Powered by

Apache), or Apache with Tomcat or IBM WebSphere. It utilizes iSeries database and security features for scalability and reliability. There is an optional RPG and DDS to Web conversion tool.

For more details, refer to:

http://www.bcdsoftware.com/progenwebsmart.htm

- XBwebservices, by INVENSO, is a SOA enabler on the iSeries. With this tool, you can register your iSeries applications and use the smart-wizard functions to build new Web services. A publish button builds and publishes the Web service application in your existing Web server environment. It is ready to use, without programming. Its features includes:
  - Creates all the required components to communicate with existing applications using Web services.
  - Easy to use in a server side scripting language like PHP.
  - Integrates seamlessly with the other XBsuite products.
  - No object oriented programming experience required.
  - Generates WSDL documents for integration with existing WS-applications.
  - Applications can be interrupted and restarted.
  - Single logon, using the host security.
  - SOAP RPC and DOC supported.
  - Supports WS-extensions like WS-security (digital certificates).
  - Extended debug and logging features.
  - Failure and fall back enablers.

  For more details, refer to:

  http://www.invenso.com/xb_integrator.php
- LANSA Client, by LANSA, gives end users graphical user interface (GUI) access to enterprise data on Windows, iSeries, AS/400, UNIX, and Linux servers. You can report, chart, and query from a single tool with unparalleled ease-of-use. You can copy data to popular spreadsheets or other PC tools for analysis. You can also dramatically reduce the application backlog by empowering end users to create their own reports. You can even publish reports to Internet Web sites.

  For more details, refer to:

  http://www.lansa.com/products/clientoverview.htm
- LANSA for the Web, by LANSA, is used to build Internet, intranet and wireless applications that securely access and update corporate data on your iSeries, Windows, Linux, or UNIX servers. LANSA's High Level Language allows you to rapidly generate industry standard graphical HTML and XHTML for both browser and wireless devices. You can turn your Web application into a Web service with the simple click of a mouse.

  LANSA Web applications use the business logic you have defined in LANSA's Object Repository, which can automatically be reused with all other types of LANSA applications, such as Windows Rich Client, iSeries 5250, and Web services. This enables all your LANSA applications to ensure that all the information stored in your database has passed all the necessary integrity checks. The repository also reduces maintenance of these applications because rules are maintained in one spot and reused throughout the system.

LANSA manages all the complexity of Web applications for you: state management, business rule validation, data conversion, and integration with different Web servers and existing applications. Developers can focus on meeting business requirements. LANSA handles the technical complexities.

For more details, refer to:

http://www.lansa.com/products/weboverview.htm

- LANSA Integrator, by LANSA, enables integration of Application-to-Application (A2A) and Business-to-Business (B2B) transactions through XML and Java services. LANSA Integrator allows bi-directional XML — and other data formats — to be exchanged between you and your trading partners, regardless of platform. It also enables integration of user-written Java services with LANSA, C, RPG, and COBOL applications.

  What can LANSA Integrator do?

  - Automate orders between a manufacturer and distributor by dynamically linking ERP systems.
  - Exchange information between ATMs and server-based banking systems.
  - Integrate a Java-based credit card application with an order entry system.
  - Send and receive XML transactions between suppliers and distributors.
  - Exchange data between a stand-alone Wireless device and the server.
  - Publish or utilize third-party Web services via SOAP.
  - Provide SOAP interfaces to your existing business functions.
  - Integrate heterogeneous CRM and back-office systems via XML over MQ Series.
  - Provide secure (digital certificates and password protected) PDF documents via e-mail for contract agreements.
  - SMS updates on the status of order or delivery transactions in real time.
  - And many more practical applications.

  For more details, refer to:

  http://www.lansa.com/products/integratoroverview.htm

- JAWFLOW 2EE (Extended Java Workflow Design Framework), by L.D. Consulting NV, is an extension of JAWFLOW and makes this concept applicable within the standard J2EE concepts. It allows you to reuse the i5 connector and business logic over the standardized Java Connector Architecture. This JCA integration is a two-fold enhancement, as it leverages your business logic for reuse in any JCA-enabled environment. It also allows you to integrate any business logic accessible by means of the JCA. At the front end, the framework allows you to develop interactive component-based Internet applications using Java Server Faces. The shared platform, however, aligns a single set of technologies that share the same mindset and architecture for all your enterprise business applications, whether they are rich-client, intranet, extranet, or Internet solutions. JAWFLOW 2 EE takes you to next level in the IBM System i Developer Roadmap, as you can reuse your business logic to incorporate all alternative front-end technologies ranging from Web services to business process management integration with IBM WebSphere MQ Workflow. JAWFLOW 2 EE standardizes the development architecture of your solutions of tomorrow without disrupting your existing applications.

  For more details, refer to:

  http://www.ldc.be/home.htm?ldc_eng/Business%20model/busmod_JAWFLOW.htm

- m-Power, by mrc, is Java-based and can run on almost any operating system, and access any database. It accelerates development by eliminating routine infrastructure programming, giving you ready-to-deploy n-tier Java Web applications in minutes.

For more details, refer to:

http://www.mrc-productivity.com/products/

- Convertigo 3.2 SP4, by TWinSoft, allows access to existing applications in a non-intrusive way (with no modifications to the existing applications) by using their existing exposed interfaces, such as 3270/5250/VT/DKU user screen interfaces or IBM CICS COMMAREA.

  Convertigo is composed of three editions to address all integration needs:

  – Convertigo publishing edition: To build intranets or extranets from existing applications or to integrate them in enterprise portals (Webization).
  – Convertigo mobile edition: To access existing applications through mobile devices, such as PDAs, smart phones, or mobile PCs.
  – Convertigo connector edition: To integrate existing applications in new SOA-based information systems by using the SOAP Web Service technology.

  For more details, refer to:

  http://www.twinsoft.fr/intl/en/cariocaweb/convertigo_present.htm

Additional tools for Web services

In addition to the ISV tools that are associated with the *Create a modular architecture* step, these tools support Web services.

- LANSA 2005, by LANSA, offers breakthrough application modernization, extension, and integration capabilities for IT development teams and software vendors on multiple platforms.

  LANSA 2005 is a powerful suite of application development and integration products that enables mid-sized organizations to overcome the complexity inherent in delivering tomorrow's applications. This release offers:

  – Enhanced and extended rapid application development capability.
  – Out-of-the-box support for Web services.
  – One-click device support.
  – Any-to-any integration.
  – A broad array of solution options for clients.

  What makes this unique from other offerings in the marketplace is that current IT staff can easily master LANSA 2005 to:

  – Assemble composite applications from existing systems and databases.
  – Deploy a browser or client/server n-tier solution.
  – Run on their platform of choice.

  For more details, refer to:

  http://www.lansa.com/products/lansa2005.htm

- centric, by looksoftware, provides direct access to the presentation, application, and database layers of your applications. Broad support for interoperability allows you to rapidly integrate them with other platforms and technologies, including .NET, Java, Windows, zSeries, and Linux.

  centric's programmatic integration support allows you to create reusable modules from your existing applications so you can benefit from Web services and service-oriented architecture (SOA).

You can use centric's flexible support for heterogeneous access and new functionality to deliver composite applications, and assemble new solutions by reusing existing components and use new look's support for smart clients to deliver sophisticated user interfaces.

centric can access information from multiple sources and apply your custom rules before distributing the information to the required destinations in real time. In summary, centric provides:

- Direct access to your 5250 and 3270 applications for presentation layer integration.
- RPC and Web services support provides powerful application layer integration.
- Support for IBM DDM and Microsoft's ADO lets you access databases, including DB2, SQL Server, ADO, and Sybase on platforms like iSeries, zSeries, Linux, and Windows.

For more details, refer to:

http://www.looksoftware.com/prod_centric.htm

- eDeveloper, by Magic Software Enterprises, provides the most productive and rapid environment for application development and integration. eDeveloper provides a revolutionary framework for customizing and deploying complex business solutions. eDeveloper addresses the principal problems in IT management today: shortage of IT resources, the need to change dynamically with business changes, and the need for full integration with existing systems and new technologies. eDeveloper V9 provides developers with an "absolutely open" development and deployment environment with powerful new messaging and integration features, advanced XML component functionality, and support for such standards as J2EE, .NET, and Web Services.

  For more details, refer to:

  http://www.magicsoftware.com/bin/en.jsp?enPage=InnerPage&enDisplay=view&enDispWhat=object&enDispWho=tech%5El1%5EseDeveloper&enZone=tech&enVersion=0&branch=hq&enretain=branch&

- Websydian Product Suite, by Soft Design A/S, contains the E-Business development tools: Web Developer, Web-Shop Developer, Wireless Developer, TransacXML Developer, and Portal developer, plus Websydian Express, an out-of- the-box Web solution.

  Websydian Web Developer provides Websydian Express, an out-of- the-box Web solution, complete with user management and enterprise security model. It further includes additional patterns as abstract solutions for typical data manipulation scenarios, with complete separation between application appearance and functionality. Websydian Web Developer allows development of J2EE applications.

  Websydian TransacXML Developer is a complete Web services application development environment, which enables corporate developers to build transactional XML application quickly and reliably, and tightly integrated with corporate back-end systems and processes. Web service development using WSDL and based on the SOAP standard is easy with TransacXML and requires no knowledge of XML.

  The Websydian Server supports the operational environment for the Distributed Websydian Architecture, including J2EE, continuously monitoring the application, performing error recovery, and enabling automatic start and stop of application services without disrupting e-business operations.

  For more details, refer to:

  http://www.websydian.com/websydiannet/app

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 107. Note that some of the documents referenced here may be available in softcopy only.

- *Best Practices for Microsoft Windows and Linux Integration in iSeries Systems,* REDP-4000
- *DB2 UDB V8.2 on the Windows Environment*, SG24-7102
- *Enabling Web Services for the IBM @server iSeries Server*, REDP-0192
- *IBM @server iSeries Windows Server Integration for Small and Medium Businesses: An Application-Serving Network Example Using Citrix Access Suite Presentation Server on Integrated xSeries Systems,* REDP-0710
- *Integrating DB2 Universal Database for iSeries with Microsoft ADO.NET*, SG24-6440
- *Managing Information Access to an Enterprise Information System Using J2EE and Service-Oriented Architecture,* SG24-6371
- *Mastering the IBM WebFacing Tool,* SG24-6331
- *Microsoft Windows Server 2003 Integration with iSeries,* SG24-6959
- *Modernizing IBM @server iSeries Application Data Access - A Roadmap Cornerstone*, SG24-6393
- *Modernizing and Improving the Maintainability of RPG Applications Using X-Analysis Version 5.6,* REDP-4046
- *Moving to Integrated Language Environment for RPG IV*, GG24-4358
- *Patterns: Implementing an SOA using an Enterprise Service Bus,* SG24-6346
- *Patterns: Integrating Enterprise Service Buses in a Service-Oriented Architecture,* SG24-6773
- *Patterns: SOA Client - Access Integration Solutions,* SG24-6775
- *Patterns: SOA with an Enterprise Service Bus in WebSphere Application Server V6*, SG24-6494
- *Student Edition: WebSphere Development Studio Client for iSeries: V5.0*, SG24-7086
- *Unleashing AS/400 Applicatons on the Internet*, SG24-4935
- *WebSphere Application Server - Express V5.0 for iSeries,* REDP-3624
- *WebSphere Application Server - Express V6 Developers Guide and Development Examples,* SG24-6500
- *WebSphere Application Server V5 for iSeries: Installation, Configuration and Administration*, SG24-6588
- *WebSphere Development Studio Client for iSeries: Bringing New Life into 5250 Applications*, SG24-6600

- *WebSphere Development Studio Client for iSeries Version 5.1.2*, SG24-6961
- *WebSphere for the IBM @server iSeries Server Buying and Selling Guide*, REDP-3646
- *WebSphere Studio 5.1.2 JavaServer Faces and Service Data Objects,* SG24-6361
- *WebSphere Studio Application Developer Programming Guide*, SG24-6585
- *WebSphere Studio Application Developer Version 5 Programming Guide*, SG24-6957
- *WebSphere Version 5.1 Application Developer 5.1.1 Web Services Handbook*, SG24-6891
- *WebSphere Version 6 Web Services Handbook Development and Deployment,* SG24-6461
- *Who Knew You Could Do That With RPG IV? A Sorcerer's Guide to System Access and More*, SG24-5402

Other publications

These publications are also relevant as further information sources:

- *IBM @server i5 and iSeries Systems Handbook*, GA19-5486
- *IBM @server iSeries Security Reference, Version 5*, SC41-5302
- *IBM @server iSeries Tips and Tools for Securing Your iSeries*, SC41-5300
- Richter, *Applied Microsoft .NET Framework Programming*, Microsoft Press, 2002, ISBN 0735614229

Online resources

These Web sites and URLs are also relevant as further information sources:

- Apache Tomcat

  `http://jakarta.apache.org/tomcat`
- developerWorks category SOA and Web services

  `http://www.ibm.com/developerworks/webservices`
- *An Independent Analysis of the iSeries Developer Roadmap*, found at:

  `ftp://ftp.software.ibm.com/common/ssi/rep_wh/n/ISW00197USEN/ISW00197USEN.PDF`
- Information about Model-View-Controller Architecture

  `http://java.sun.com/blueprints/patterns/MVC.html`
- iSeries Information Center

  `http://www.ibm.com/eserver/iseries/infocenter`
- JavaBeans

  `http://java.sun.com/products/javabeans/index.jsp`
- JavaServer Faces

  `http://java.sun.com/j2ee/javaserverfaces`
- System i Application Innovation Roadmap 2006 Education Offering

  `http://www.developer.ibm.com/vic/hardware/portal/iii_pages/iii_applinnov_education#`

- System i Developer Roadmap

  http://www-03.ibm.com/servers/eserver/iseries/roadmap/
- Technical support and resources for System i

  http://www-912.ibm.com/
- Virtual Innovation Center for Hardware - IBM + IBM Business Partner Tools

  http://www.developer.ibm.com/vic/hardware/portal/iii_pages/iii_tools_innov_roadmap
- WebSphere Application Server Version 4.0 Advanced Edition for iSeries

  http://publib.boulder.ibm.com/was400/40/AE/english/docs
- WebSphere Development Studio Client for iSeries information and help

  http://publib.boulder.ibm.com/infocenter/iadthelp/index.jsp
- WebSphere Studio Application Developer

  http://www.ibm.com/software/ad/studioappdev
- WebSphere Studio Site Developer

  http://www.ibm.com/software/ad/studiositedev

How to get IBM Redbooks

You can search for, view, or download Redbooks, Redpapers, Hints and Tips, draft publications and Additional materials, as well as order hardcopy Redbooks or CD-ROMs, at this Web site:

ibm.com/redbooks

Help from IBM

IBM Support and downloads

ibm.com/support

IBM Global Services

ibm.com/services

IBM System i Tools Innovation Program:

Resource Guide for Modernization and Integration Tools for System i Applications

Redpaper

ISV tools for modernization and integration (including with .NET)

IBM tools for modernization and integration

IBM System i Developer Roadmap

The IBM System i Tools Innovation program is part of the IBM System i Initiative for Innovation program introduced in early 2005. There are over 125 independent software vendors (ISVs) that are members of this program. These ISVs have tools available to help other ISVs and clients with some aspect of enhancing, modernizing, and integrating existing System i applications.

This IBM Redpaper focuses on a subset of the ISVs that have tools to help modernize or integrate System i applications. The ISV tools identified in this paper have been certified as IBM ServerProven, meaning they are available today and they have been successfully installed at client accounts. The System i Developer Roadmap, associated with the System i Tools Innovation program, identifies the modernization steps and relies on tools from IBM and ISVs that focus on System i application modernization and integration. The ISVs referenced in this Redpaper are all members of the System i Tools Innovation program.

The System i Developer Roadmap has five high level steps:

- Improve your productivity
- Enhance the end-user experience
- Create a modular architecture
- Integrate applications
- Integrate business processes

This Redpaper is an ideal resource guide that provides a brief description of the IBM and ISV tools associated with the selected steps and subcategories in the roadmap. The paper aids System i developers searching for and evaluating the IBM and ISV tools available. Links are provided to the appropriate IBM tool and ISV tool Web sites.

INTERNATIONAL TECHNICAL SUPPORT ORGANIZATION

BUILDING TECHNICAL INFORMATION BASED ON PRACTICAL EXPERIENCE

IBM Redbooks are developed by the IBM International Technical Support Organization. Experts from IBM, Customers and Partners from around the world create timely technical information based on realistic scenarios. Specific recommendations are provided to help you implement IT solutions more effectively in your environment.

For more information:
ibm.com/redbooks