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Developer Productivity Study: Comparing Microsoft BizTalk Server 2006 to SAP XI for Integrating Heterogeneous Systems

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EXECUTIVE SUMMARY

In today's collaborative business-to-business environment, enterprise resource planning (ERP) applications within the organization—including customer relationship management (CRM), HR, and custom legacy applications—are increasingly integrated both with each other and with external suppliers and customers running their own heterogeneous set of applications.

Integrating large-scale applications such as SAP with external systems, however, requires ongoing development and maintenance. Accommodating the changes resulting from mergers and acquisitions, complying with the latest new security and privacy regulations, and meeting the new guidelines for corporate governance introduce even more complexity into the enterprise IT environment. Today's business applications not only run on a number of different platforms, they are often implemented in a variety of programming languages, running on multiple operating systems.

To meet these demands, enterprise developers are progressively merging systems and infrastructure into comprehensive integration suites by relying on service-oriented architectures (SOA) that make integration possible at a lower total cost of ownership (TCO). Microsoft engaged Crimson Consulting Company, a leading provider of consulting services to the high technology industry, to conduct a comparative study of developer productivity with integration servers Microsoft® BizTalk® Server 2006 and SAP XI 3.0, using mySAP™ ERP in heterogeneous environments. A third-party lab specializing in professional services practices for Microsoft BizTalk Server and SAP XI executed the study per Crimson's direction.

To compare the savings achieved by Microsoft BizTalk Server and SAP XI, Crimson created three testing scenarios that replicate the flow of synchronous and asynchronous messages in typical heterogeneous business integration situations in IT environments:

- Emulation of an order placement on a retail online marketplace
- Shipment tracking for a placed order
- Messaging between mySAP ERP and a retail online marketplace

Key findings from the test scenarios include the following:

- The productivity savings for developers using BizTalk Server range from 26.96% to more than 40.57%. The corresponding savings in dollars range from \$32,350 to \$48,688.¹
- The annual cost savings² for software licensing observed in the lab environment were 72% per processor. The corresponding savings in dollars amount to \$78,187.

These lab findings also apply to real-world customer situations. The study found that in typical mid-size and large-size organizations, customers may achieve the following savings:

- The expected productivity savings for both mid-size and large-size organizations varies between 26.96% and 40.57%
 - For mid-size organizations, the savings in dollars will range from \$485,252 to \$730,323.
 - For large-scale organizations, savings in dollars will range from \$970,503 to \$1,460,646.
- Cost savings in software licensing for mid-size and large-size organizations are respectively 72.2%³ and 83.7%.⁴

¹ The savings in dollars were calculated with use of the results observed in the lab environment.

² Data on SAP XI licensing data are based on the information shared by SAP customers.

- The corresponding savings in dollars will range from \$624,040 to \$1,234,600.
- The application-specific adapters included with BizTalk Server may drive cost savings even higher.

Administration savings related to ongoing IT support and maintenance may increase significantly as the cost of multiple integration servers is removed from IT budgets. Additional findings verified that BizTalk Server's strengths in the developer environment include its product maturity, tight integration with other Microsoft software solutions, and powerful adapter offering with a wide range of applications.

A NOTE ON CRIMSON'S APPROACH

Crimson had complete autonomy in defining the testing methodology as well as the analysis and interpretation of the measurements and results. Microsoft commissioned this study to better understand and validate the productivity gains achieved by users of BizTalk Server technology in comparison with those of SAP XI. The findings presented here are based on results of testing conducted by a third-party lab, as well as publicly available information. Crimson Consulting analyzed the lab results and summarized the findings described in this paper. Sources are identified when third-party data is used to support these findings. The implementation in each scenario is not intended as a best practice for customer environments and the resulting savings may vary depending on various factors. Neither SAP nor Microsoft was involved in the designs; each represents a real-world example of how a user would address a likely set of integration challenges.

Both Microsoft BizTalk Server 2006 and SAP XI 3.0 are components in each vendor's enterprise infrastructure, where it is typically accompanied by other software such as a database server, an authentication server, and other server technologies. Both Microsoft and SAP promote their complete product lines as an end-to-end integration solution. When evaluating integration solutions one should consider these lab results in that context.

³ The mid-size scenario assumes low-to-mid transactional volume up to 50GBytes per month.

⁴ The large-size scenario assumes high transactional volume from 250GBytes up to 500GBytes per month.

SAP R/3 AND TODAY'S IT ENVIRONMENT

Over the past decade, the SAP R/3 ERP business application has achieved significant success in the marketplace. However, to meet today's business collaboration demands, all the applications within the typical heterogeneous enterprise organization—including custom legacy applications, CRM and HR applications, or trading partner, supplier, and customer applications—must be able to fully integrate with SAP R/3 in order to create a cohesive, integrated flow of information for employees, suppliers, and customers. Successful integration must accommodate changes to applications resulting from mergers and acquisitions, and comply with new security or privacy regulations. These applications not only run on multiple platforms, they may be implemented in a variety of programming languages as well.

Today's enterprise architects demand an integration platform in a heterogeneous environment that can achieve the following:

- Accomplish intra-company integration, usually referred to as Enterprise Application Integration (EAI); and integration with external systems, referred to as B2B (Business-to-Business), as well as Business Process Automation (BPA).
- Work effectively in conjunction with the diverse enterprise systems (ERP, HR, CRM, custom) from a diverse set of vendors, found in almost every enterprise environment.
- Accommodate constant change in business processes without excessive coding.

To satisfy these significant demands, the market is looking towards merging enterprise systems and infrastructure into comprehensive integration suites, relying on service-oriented architectures (SOAs) to enable the integration efforts and achieve a lower total cost of ownership (TCO). Industry analyst firm ZapThink predicts that the need for SOA-based applications will become the primary driver of integration suite adoption.

"Integration has been a headache and challenge for most enterprises for decades," says analyst **Ron Schmelzer**. "Traditional EAI and B2Bi solutions have offered some relief for integration challenges, but at great expense, complexity, and rigidity. Web Services-based Service-Oriented Architecture (SOA) offers a better path for integration through Service-Oriented Integration (SOI) techniques that provide a standards-based, loosely coupled, composite approach to connecting systems."

This market opportunity, however, puts pressure on many production systems that were built before the Internet era. SAP R/3 has its roots in a mainframe environment⁵ that was migrated to a client-server paradigm in the 1990s. However, the client-server paradigm can be too rigid for most modern, Internet-based enterprises, as it typically assumes scenarios with point-to-point integration and time-consuming exchange of batch files.

SAP recognized and addressed these limitations by introducing the mySAP Business Suite, a solution based on an SOA architecture that utilizes all advantages of N-tier paradigm. It is accompanied by the SAP integration platform NetWeaver, which offers a multilayer approach for integrating N-tier systems. The layer responsible for middleware integration and messaging is the Exchange Infrastructure 3.0, and is usually referred as SAP XI server.

⁵ "The Leader in Business Software Solutions" by Stefan Gruber, Head of Investor Relations, SAP AG, November 2003

CHALLENGES FACED BY THE SAP NETWEAVER PLATFORM

SAP NetWeaver has demonstrated considerable success with integrating internal systems from the mySAP Business Suite. However, in many cases it is also necessary for enterprises to integrate the same applications or other legacy solutions with non-SAP internal and external systems, running on a variety of platforms. Industry analysts have identified a number of issues regarding the performance and functionality of SAP NetWeaver:

- SAP NetWeaver represents a collection of diverse components rather than a single integration platform. Many of these components are relatively immature⁶ and have limited functionality. For instance, SAP Master Data Management is less mature than the other components of SAP NetWeaver platform.⁷
- Using SAP NetWeaver requires upgrading SAP R/3 systems running in production environments to the mySAP Business Suite. These upgrades represent a significant cost to organizations. As of 2004, less than 5% of SAP customers had upgraded. It is expected that by 2007, 50% will have migrated.
- The NetWeaver SAP XI server partially relies on the proprietary SAP language, ABAP, in addition to Java. This configuration requires integration developers to continuously switch between development environments. As a result, developers' productivity is negatively impacted.
- SAP XI has a limited functionality for design and modeling. Developers must rely on third-party solutions, such as IDS-Scheer ARIS, to accomplish critical tasks, such as creation of business rules. Developers also must create custom code to substitute missing product functionality, such as externalizing business rules to support dynamic changes and surfacing key performance indicators (KPIs) via an integrated business activity monitoring (BAM) infrastructure. The requirement for additional resources drives up the TCO for SAP XI-based integration.
- SAP XI is known to provide only sparse documentation on its implementation methodology,⁸ making the implementation process more complex and requiring the hiring of expensive external consultants.

These known challenges with SAP XI makes Microsoft BizTalk a cost-efficient alternative for integrating many disparate business applications, including mySAP ERP.

Based on these findings, Microsoft decided to commission a study to compare the impact of developer productivity using Microsoft BizTalk Server and SAP XI in total cost of operations for integrating heterogeneous systems.

⁶ Gartner Research "SAP Wants Its Loyal Users to Spread XI Integration Platform", April 2004

⁷ Gartner Research "ERP Upgrades Will Reflect the Uncertainties of the Overall Market", March 2005

⁸ Dave Bernard "Hitting the Stride with SAP XI"

INTRODUCTION TO CRIMSON METHODOLOGY

A. RATIONALE BEHIND THIS COMPARISON

Crimson found that although data existed comparing the features of SAP XI and BizTalk Server, no study had ever been done to accurately measure integration developer productivity for both products in an SAP-centric environment. Since development costs constitute a significant operating expense within the enterprise, it is necessary to understand their impact on the true cost of in-house integration efforts. Additionally, the impact of SAP XI and BizTalk Server in heterogeneous environments was not clear. Crimson therefore chose to measure the productivity savings using BizTalk Server and SAP XI for scenarios commonly used in conjunction with SAP when integrating with disparate systems. Although the lab cases conducted were specifically tested with the mySAP ERP, Crimson believes the results can also be readily demonstrated with other business applications.

B. METHODOLOGY OVERVIEW

Testing Categories

Although it is difficult to discuss developer productivity with a software product in general, this study estimates how efficiently a group of experts using both Microsoft BizTalk Server and SAP XI were able to develop a solution for typical business scenarios (purchase order requests, shipment status notification, updating purchase order information, etc.) found in most modern enterprises, where SAP is connected to other internal enterprise systems and to systems outside the enterprise.

All testing scenarios were divided into four major categories, as shown in the table below, that define the stages of a standard integration project. These categories include Design and Modeling, Development, Deployment, and Testing and Monitoring. Crimson further divided each category into subcategories, where tasks of similar granularity were grouped together. All tasks in each testing scenario fell under one of those four groups. Each category was assigned a weight that reflected its relative importance from the software engineer's perspective within an end-to-end development scenario for integration. Assigning relative weight for each task helps us with accurate calculations of workday and productivity savings (discussed in the next section). For example, due to the focus of our study, relative importance of development tasks is reflected in the higher weight.

Workload Weighting/Testing Categories	Weight
Design and Modeling	20%
Development	40%
Deployment	20%
Testing and Monitoring	20%

Measurement Dimensions

Crimson's methodology evaluated the execution of testing scenarios with multiple dimensions—both quantitative and qualitative—as the most objective way to compare SAP XI and BizTalk Server. Three dimensions to measure the developer productivity were considered:

- Task Duration. This testing dimension represents the average time developers needed to accomplish each task using both BizTalk Server and SAP XI. Each testing scenario was run three times by different developers, who were skilled only on their respective platforms, to avoid any impact from individual developer efficiency resulting in an incidental error on the final outcome. Since very skillful as well as very inexperienced developers fall outside of the standard deviation, only the average duration for all tasks from each task category was measured.
- Number of Steps. This testing dimension represents the number of steps needed to accomplish a task in each scenario. There is an assumed correlation between the number of steps and the duration of a particular task. Although such a correlation can be less than straightforward, it provides a qualitative insight into why a particular task took less time with a specific product.
- Completeness. This testing dimension indicates whether a particular feature was fully supported by the product. The completeness attribute identifies and compares the set of product features directly attributable to each task in the scenario. Completeness of features in SAP XI and BizTalk Server was compared. Once each task was graded, the scores for all tasks were used to calculate the average completeness rating for a category.

Task duration is the most important objective measure to determine the savings in performing typical development tasks. Measuring the number of steps and completeness were used as additional dimensions to help understand the logic behind a lesser task duration for one product versus the other. These dimensions also correlate the products' efficiency and features with developer productivity.

Calculation of Productivity Savings

The productivity savings were calculated for each testing scenario:

Workday Savings: This measurement allowed testers to estimate the relative importance of time savings for each category in a scenario. Workday Savings were calculated as Time Savings for a category multiplied by the workload weight for the same category. Once the Workday Savings were calculated for each category, Crimson analysts determined the total savings in a scenario simply by totaling the savings in each workday.

Productivity Savings: Analysts calculated the Productivity Savings by multiplying the integration developer's annual compensation and Workday Savings for this scenario. Since a developer may build numerous integration interfaces throughout the year, this estimate helps IT managers understand the budget savings on all interfaces:

*Productivity Savings for a Scenario = Annual Compensation * Total Workday Savings for a Scenario.*

COMPARATIVE STUDY OF DEVELOPER PRODUCTIVITY

Crimson validated its methodology in the lab environment, where a typical online retail scenario was re-created (see Figure 1). The main components included a transactional order processing system, back-end enterprise applications (mySAP ERP), and a front-end website where external users place their orders. Once an order is placed, the buyer has the opportunity to update the shipping information and track the purchase.

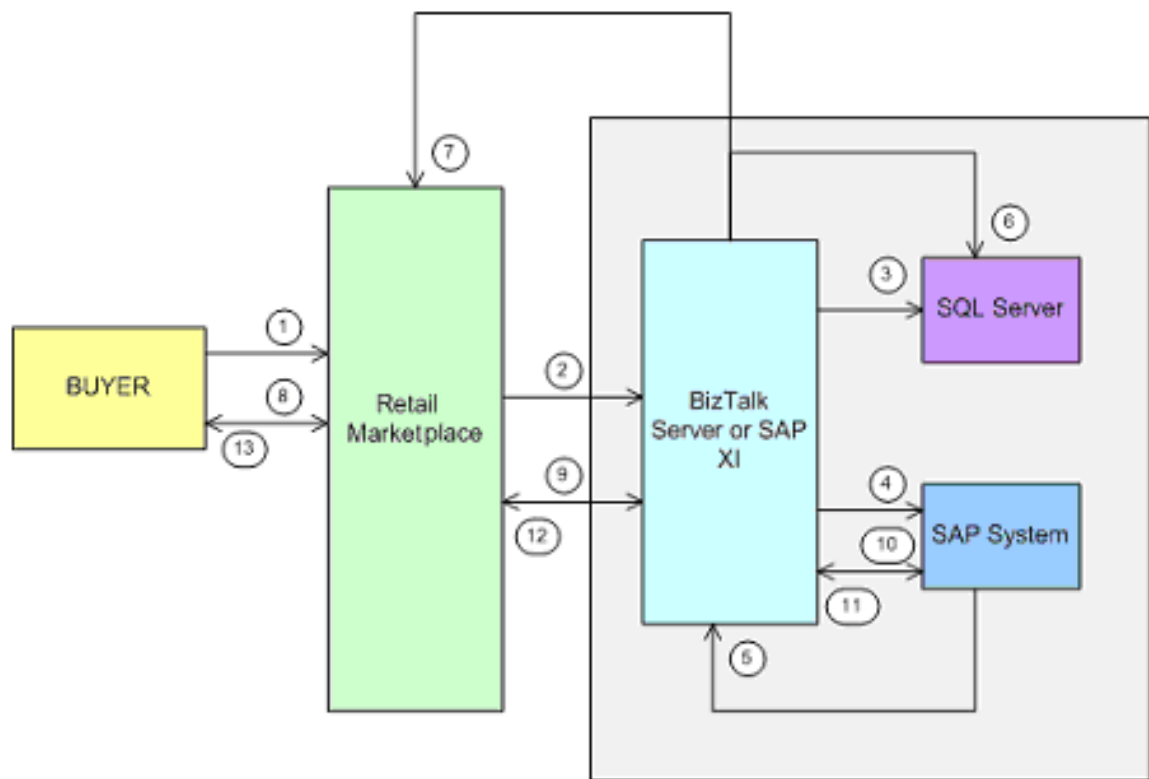


Figure 1: Overall Diagram for Testing Scenarios

The following high-level steps identify the following actions:

1. A buyer places a purchase order on the retail market website.
2. The retail market website places a purchase order in the supplier's system by sending a flat file to the integration server (BizTalk Server or SAP XI).
3. Once order approval is received, the integration server creates a new purchase order in SQL Server, resulting in an update of the data in SQL Server. The buyer can now check order status through the website.
4. The integration server creates a new order in the SAP system (once the order approval is received) to conclude the order processing with SAP.
5. The SAP business user updates the shipping status of the purchase order, using a standard VA02⁹ transaction in an SAP system. This update triggers an IDoc to the integration server.
6. The integration server updates the shipping status in SQL Server using a web service.
7. The integration server updates the retail website using a web service.
8. The buyer updates shipping address details for an existing order on the retail website.
9. The retail website places the shipping address details into an update request in the supplier's system by sending a web service request to the integration server.
10. The integration server updates the order in the SAP system.
11. The SAP system returns the update confirmation to the integration server.
12. The integration server returns a confirmation for this update to the retail website.
13. The retail marketplace returns the confirmation to the buyer.

This retail activity can be defined as three distinct use cases:

- A message flow from an external data source (e.g., the retail website) to the mySAP ERP system via an integration server (either SAP XI or Microsoft BizTalk Server) that can be referred to as placing a purchase order request.
- Moving the message in the opposite direction, from the mySAP ERP system to the retail website via an integration server that can be referred to as shipment status notification.
- Synchronous messaging between mySAP ERP and the retail website typically used in business operations such as updating purchase order information (e.g., updating shipping information).

In each case, the individual steps of each business process flow were distributed across the four major categories previously described in Crimson's methodology (*Design and Modeling, Development, Deployment, Testing and Monitoring*). The analysis was conducted within these four major categories.

It is noteworthy that the assumptions used in all three use cases can extend their applicability from mySAP ERP, where they were tested, to other enterprise applications, such as Siebel, PeopleSoft, Oracle Financials, J.D. Edwards, or other custom developer applications deployed in typical heterogeneous environments.

A. COST SAVINGS FOR DEVELOPER PRODUCTIVITY IN THE LAB ENVIRONMENT

1. Scenario 1: Integration Server-to-mySAP ERP

⁹ SAP VA02 is a standard SAP notation for a Change Sales Order

This scenario simulates B2B integration between a retailer's marketplace website and its supplier's internal systems. Upon placing a new order, the retail marketplace website sends the purchase order information to the integration server (SAP XI or BizTalk Server) in a flat file format. The supplier uses mySAP ERP for order processing and also maintains the order data in a Microsoft SQL Server™ database (e.g., an online eCommerce database used for maintaining the purchase order history). The integration server acts as middleware between the retail application and the supplier's internal systems. The integration server also determines the business process flow based on defined business rules.

The following steps describe the business process flow at a high level for this scenario:

1. The buyer places a purchase order on the retail marketplace website.
2. The retail marketplace application sends a new purchase order request by sending a flat file to the supplier's integration server (BizTalk Server or SAP XI Server).
3. The integration server processes the received purchase order information. Processing includes applying business rules to check if the purchase order approval from a business user is required or if it is automatically approved. In this scenario, purchase orders that have a total order value of more than a defined value require purchase order approval.
4. The integration server creates a new purchase order in the Microsoft SQL Server database only after receiving purchase order approval from business users, if required.
5. The integration server creates a new purchase order in mySAP ERP only after receiving purchase order approval from business users, if required.

Figure 2 presents the business process workflow defined in the integration server for this scenario.

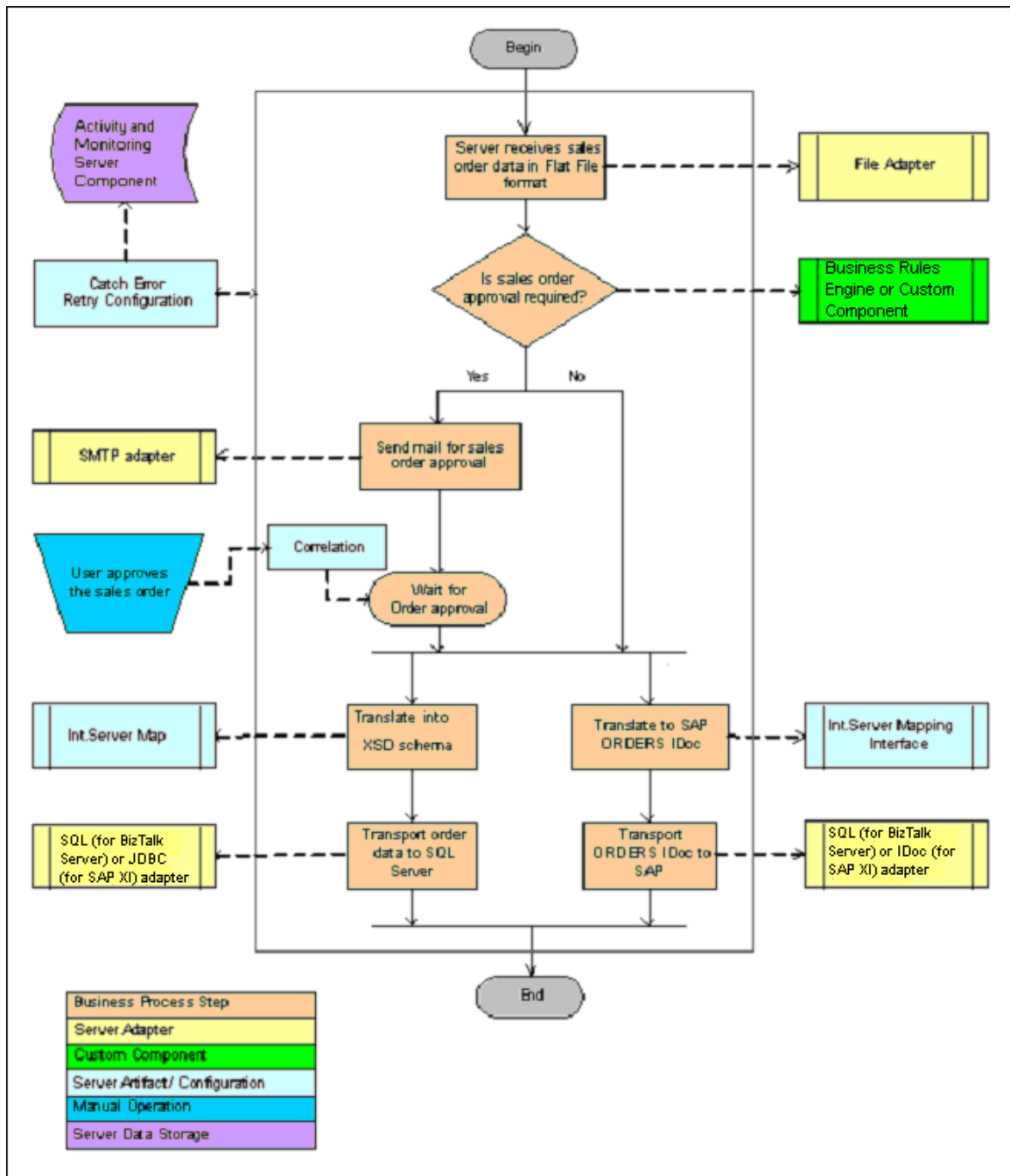


Figure 2: Diagram for Scenario 1 - Integration Server-to-SAP R/3

Test Results: The test results comparing developer productivity with BizTalk Server and SAP XI are presented in the table below.

	BizTalk Server	SAP XI	BizTalk Server	SAP XI	BizTalk Server	SAP XI
Phase	Average duration in minutes	Average duration in minutes	Number of steps	Number of steps	Completeness	Completeness
Design & Modeling	8.33	22.33	28	138	4.500	4.000
Development	146.67	182.00	602	1277	4.200	4.091
Deployment	21.00	55.00	85	319	4.750	4.750
Testing & Monitoring	8.67	14.33	24	40	3.250	3.000
Totals	184.67	273.67	739	1774	4.175	3.960
% Difference – (SAP-BizTalk Server)/SAP	32.52%		58.34%			
Workday Savings	40.57%					

Qualitative Analysis: Microsoft BizTalk Server demonstrated the best results for Scenario 1.

- The BizTalk Server developer needed 184.67 minutes to complete the scenario, 32.52% less than the time it took for the SAP XI developer to perform the same tasks.
- Additionally, the BizTalk Server developers used 58.34% fewer steps to complete this scenario, as opposed to SAP XI.
- These results amount to workday savings of 40.57% for BizTalk Server when the integration developer is working on an interface in Scenario 1.
- This significant difference in savings was identified as resulting from easy-to-use development tools and the availability of the BizTalk Server Business Rules Engine.

The explanation of results in each category is given below.

- **Design and Modeling:** This category consisted of two lab exercises for BizTalk Server. The first exercise was to create a new BizTalk project, which acts as a container for all BizTalk solution-related artifacts such as schemas, maps, and orchestrations. The next exercise was to design a BizTalk orchestration, representing the business process, using the Orchestration Designer tool. The developers used Microsoft Visual Studio® 2005 development system to complete both exercises.

BizTalk Server developers were able to complete all tasks for this category in 28 steps, with an average duration of 8.33 minutes.

For SAP XI, this category included three exercises. The developers started by creating new product and software components, and assigning the software components to the product using the System Landscape Directory (SLD) tool. Then they created technical and business systems and bound those to each other, also using the SLD tool. Finally, the developers designed the integration process, representing the business process, using the SAP XI Integration Builder tool. The SAP XI developers finished the tasks, consisting of 138 steps, in an average duration of 22.33 minutes.

Using BizTalk Server, the developers observed a time savings of 62.70% and 79.71% fewer steps for this category when compared to SAP XI. BizTalk Server and SAP XI were rated at 4.5 and 4.0, respectively, by the lab developers.

The following observations were also made while performing design and modeling tasks for BizTalk Server and SAP XI:

- The number of tools required in the designing and modeling category was fewer for BizTalk Server than the number of tools required by SAP XI. This resulted in less switching between tools, better user navigation, and saved time for developers, along with providing a better and more integrated design experience.
- The user interface design for the screens in SAP XI was observed to be less efficient and user-friendly than BizTalk Server. This made it somewhat more difficult for developers to follow each step and increased task duration. In particular, it was noticed that the toolbar in the Integration Builder tool in SAP XI was not feature-rich.
- Even though the SAP XI objects such as products, software components, and technical and business systems were easily transportable and reusable, BizTalk Server provided tighter integration between the solution artifacts as a whole, making it easier for developers to share the same information when working in large team environments.
- BizTalk Server developers found it easier to integrate business rules with the business process compared to SAP XI, due to the availability of built-in tools. While BizTalk Server developers simply called the rules by configuring native orchestration shapes, SAP XI developers had to write custom code and import it into the integration process using Java packages.

Additionally, the following features from both BizTalk Server and SAP XI were described as useful, although they were not directly used for developing the lab scenarios:

- The Orchestration Designer for Business Analysts (ODBA) tool, also known as a Microsoft Office Visio® Snap-in, allows developers to directly import workflows from the business analyst's workstation into the Visual Studio environment. This saves a considerable amount of time for BizTalk Server developers in designing and modeling business processes.
- BizTalk Server developers make use of features from the Visual Studio 2005 environment, such as its integration with Microsoft Visual SourceSafe™. This becomes very helpful for version control if development is done in a team environment.
- The tools of SAP XI are implemented both as ABAP transactions and Java applications, allowing developers to use the tools which they are most comfortable with.¹⁰
- **Development:** This category consisted of ten lab exercises for BizTalk Server. Developers generated an XSD schema for the ORDERS05 IDoc using the Add Adapter Wizard in Microsoft BizTalk Adapter v2.0 for mySAP Business Suite (hereafter referred to as "the Adapter"). The developers generated an XSD schema for SQL stored procedures, using the Add Adapter Wizard in the BizTalk Server SQL adapter.

¹⁰ See "Accessing Tools" section in http://help.sap.com/saphelp_nw04/helpdata/en/89/05793c05f0807be1000000a11405a/content.htm

The next exercise was to create three XSD schemas using the BizTalk Editor, for purchase order messages received from the external website, purchase order approval request messages, and purchase order approval response messages. The developers used the Pipeline Designer tool in BizTalk Server to create three custom pipelines for translating incoming purchase order messages from flat file to XML format, sending an e-mail message in HTML format from the BizTalk orchestration using the MIME/SMIME encoder component and sending purchase order IDoc messages to mySAP ERP in a flat file format.

Testers then defined three maps using the BizTalk Mapper tool for transforming messages into purchase order approval request messages, purchase order IDoc messages, and SQL stored procedure messages; and the Orchestration Designer tool was used to define message variables and logical ports. Developers implemented business rules using the Business Rule Composer tools and integrated the business process, including connecting logical ports with respective shapes in the orchestration. Finally, developers compiled the BizTalk project into a BizTalk assembly. The developers finished all the development tasks for this scenario in an average of 146.67 minutes and in 602 steps.

SAP XI developers had to complete 11 lab exercises to accomplish the development tasks for the same scenario. Developers began by importing software components and creating namespaces in the SAP XI Integration Repository. They used wizard-based functionality in the Integration Builder to import ORDERS05 IDoc from the SAP system, and wrote custom code in XSL using a free third-party tool to implement business rules and import them into integration repository archives.

The developers defined data types, message types, message interfaces, message mappings, and interface mappings for purchase order messages, purchase order approval response messages, purchase order IDoc messages, and SQL stored procedure messages using the Integration Repository. They integrated the business process, which included assigning the abstract messages to receive, transform, and send shapes of the integration process. Finally, developers activated all the objects created under software components for this scenario. The average duration and number of steps to complete these exercises was 182 minutes in 1,277 steps.

In this series of tests, BizTalk Server demonstrated a time savings of 19.41% and 52.86% fewer steps compared to SAP XI. For their completeness scores, BizTalk Server and SAP XI were rated at 4.2 and 4.091, respectively, by lab developers.

Additionally, while performing development tasks, the BizTalk Server and SAP XI developers made the following observations:

- Both products provided wizard-based functionality to generate ORDERS05 IDoc schema, but BizTalk Server demonstrated a tighter integration of tools within the Visual Studio development environment. Also, BizTalk Server offers capabilities that make it easier to navigate during use: For example, it provides functionality for searching objects.
 - The Business Rules Engine (BRE) component of BizTalk Server allowed developers to easily build business rules and integrate them with the business process more efficiently. SAP XI developers had to write custom code to develop similar functionality.
 - SAP XI developers also had to manually create the functionality for importing standard SQL table structures.
-

The following features for both BizTalk Server and SAP XI were also described as useful, although they were not directly used for developing the lab scenarios:

- BizTalk Server includes a flat-file wizard that allowed developers to create XSD schemas based on a flat file message instance, saving development time.
 - The Business Rules Composer (used to create business rules in Scenario 1), supports versioning of business rules and publishing them without redeploying or stopping the running BizTalk application. This reduces the involvement of developers in maintaining the application.
 - SAP XI allows creating templates based on the existing mappings and reusing those.
- **Deployment:** The Deployment category consisted of four lab exercises for BizTalk Server. Developers first deployed the BizTalk solution using the Visual Studio environment. They used the BizTalk Administration console to create five physical ports for receiving purchase order flat file messages, sending e-mail for purchase order approval, receiving purchase order approval response, and sending messages to the SQL server and mySAP ERP. Developers then bound these physical ports with the logical ports created in the previous exercises. They finally enlisted and started the orchestration using the BizTalk Administration console. These exercises consisted of 85 steps and took around 21 minutes of duration.

For SAP XI developers, this category consisted of eight exercises. The first was to create an integration scenario in the Integration Directory. Developers imported business systems, consisting of inbound and outbound interfaces and software component versions from the System Landscape Directory (SLD), and created business services for abstract business entities. They then imported the integration process service previously created in the Integration Repository. Communication channels and sender agreements were created to send and receive messages, and senders and receivers were configured by defining respective receiver determination, interface determination, and receiver agreement steps. As the final exercise, developers activated all the created objects. These exercises were accomplished in 319 steps, using 55 minutes.

BizTalk Server demonstrated a time savings of 61.82% and 73.35% fewer steps compared to SAP XI. For completeness of features in the product, BizTalk Server and SAP XI were both rated at 4.750 by the lab developers. Additionally, the lab developers made following observations while performing the deployment tasks:

- BizTalk Server provided a single Microsoft Management Console (MMC)-based administration tool (the BizTalk Administration console) to perform all application deployment and management activities. The administration console interface was found to be easier to use and navigate than deployment tools in SAP XI.
- Configuring ports in BizTalk Server was found to be easier than creating communication channels, sender agreements, and configuring senders and receivers in SAP XI.

Additionally, the following features for both BizTalk Server and SAP XI were also described as useful, although they were not directly used for the lab scenarios:

- BizTalk Server provides the ability to combine all the application and binding information into MSI packages, which can be sent to BizTalk Server administrators to perform a wizard-based application installation. BizTalk Server also maintains backward compatibility for MSI packages created in earlier versions of BizTalk Server.
 - For scenarios where business rules are more volatile and complex, the need for redeploying the application is less in BizTalk Server, compared to SAP XI. This is because the business rules and business process may be separated in a BizTalk Server implementation.
 - BizTalk Server enables logical grouping of all the related design-time artifacts, messaging components (receive ports, receive locations, and send ports), and other related items into one application, which makes it easier for developers to manage the application and is useful in migrating the solution from one environment to another. There is similar functionality available in SAP XI, where the grouping of design elements and configuration objects may be accomplished in the Integration Scenario.
- **Testing and Monitoring:** The tasks related to this category were divided into four lab exercises for BizTalk Server. The developers started with testing the solution using a custom web application, which allowed entering the purchase order information via a simple web form. They used the Event Viewer and Health and Activity Tracking (HAT) tools to monitor the service instances and message flow. Using these tools, the developers completed the exercises for this category in 24 steps and 8.67 minutes.

The testing and monitoring tasks for SAP XI were grouped into five lab exercises. The SAP XI developers used the same web application to test the developed and deployed solution. They utilized SAP XI's web-based Runtime Workbench to monitor the messages and processes processed by the Integration Server. It took 40 steps and 14.33 minutes to complete these activities.

In these exercises, savings in duration and number of steps observed for BizTalk Server were 39.50% and 40%, respectively, compared to SAP XI. The lab developers rated BizTalk Server and SAP XI as 3.250 and 3, respectively, in this category. Additionally, the developers observed that:

- Both products included built-in features for testing design artifacts, such as maps, at development time. This enabled developers to correct errors at an early stage.
- Both products were capable of logging all errors in the system, allowing them to be tracked using monitoring tools.

Additionally, the following features were described as useful, although they were not directly used for the lab scenarios:

- BizTalk Server's Orchestration Debugging feature in Health and Activity Tracking (HAT) allows developers to set breakpoints on orchestration shapes and debug an orchestration step by step at run time. This helps developers to trace the activities and examine information about local variables, messages and their properties, ports, etc., at every step of the business process.
 - Neither product provides any built-in tool to automate the testing processes.
-

2. Scenario 2: mySAP ERP-to- Integration Server

Scenario Description: This scenario demonstrates sending data from the SAP system to the integration server asynchronously using IDocs. In this scenario, the SAP system triggers an IDoc when the SAP business user updates the shipping status of an existing purchase order, using a standard VA02 transaction in the SAP system. The integration server receives the generated IDoc, processes it, and updates the different external systems. The external system in this scenario is the Microsoft SQL Server database, which is updated using a custom developed web service.

The high-level steps of the second scenario (see Figure 3) identify the following:

1. User updates shipping status of an existing order in SAP.
 2. The integration server receives the ORDERS IDoc from SAP.
 3. Information is translated into XSD schema (Web Service Parameters).
 4. Shipping status of the order is updated in SQL Server via web service.
-

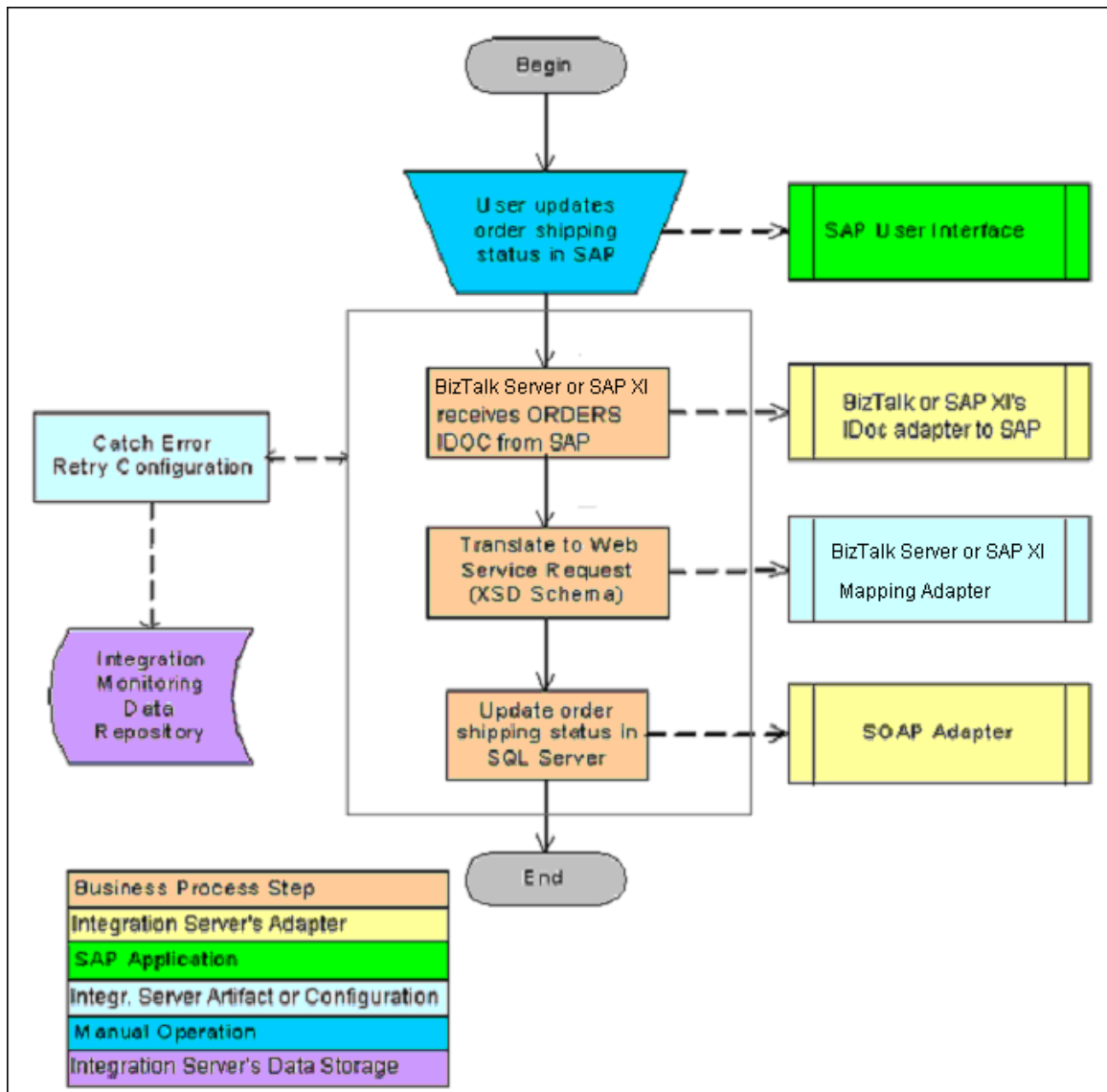


Figure 3: Diagram for Scenario 2 - mySAP ERP-to- Integration Server

Test Results: The test results comparing developer productivity with BizTalk Server and SAP XI are presented in the table below.

	BizTalk Server	SAP XI	BizTalk Server	SAP XI	BizTalk Server	SAP XI
Phase	Average duration in minutes	Average duration in minutes	Number of steps	Number of steps	Completeness	Completeness
Design & Modeling	7.00	16.00	20	88	4.500	4.000
Development	36.67	42.33	122	161	4.222	4.222
Deployment	18.00	30.33	41	129	4.750	4.571
Testing & Monitoring	13.33	15.00	31	39	3.250	3.000
Totals	75.00	103.66	214	417	4.181	3.948
% Difference (SAP –BizTalk)/SAP	27.65%		48.68%			
Workday Savings	26.96%					

Qualitative Analysis: Microsoft BizTalk Server demonstrated positive savings over SAP XI in Scenario 2. This relatively simple scenario focused on shipment tracking, and does not include validation of business rules or any related development of custom code.

- It took an average of 75 minutes for a BizTalk Server developer to complete the scenario, or 27.65% less than the time it took for SAP XI to do the same.
- It took 48.68% fewer steps for BizTalk Server to complete this scenario, versus SAP XI.
- This difference amounted to a workday savings of 26.96% when an integration developer worked on the interface in Scenario 2.
- Besides a significant difference in savings, BizTalk Server also demonstrated improved mapping over SAP XI.

The explanation of the results for each category is given below.

- **Design and Modeling:** As in the first scenario, this category included two exercises to develop using BizTalk Server. Developers created a new BizTalk project using the Microsoft Visual Studio 2005 environment. They designed the BizTalk orchestration using the integrated Orchestration Designer tool. The total task duration for BizTalk Server was 7 minutes and 20 steps.

For SAP XI, developers performed similar exercises to those in Scenario 1. They began by creating product and software components and associating software components to the product using the System Landscape Directory (SLD) tool. Then they created technical and business systems and bound those to each other, using the SLD tool again. Finally, developers designed the integration process, representing the business process, using the SAP XI Integration Builder tool. The SAP XI testers completed the tasks, consisting of 88 steps, in an average duration of 16 minutes.

The developers made following observations while performing the design and modeling exercises for this scenario:

- For SAP XI products, software components, technical and business systems had to be created in System Landscape Directory before designing the integration process. There was no need to set up these kinds of components

or systems in BizTalk Server. This increased the difference in total duration and number of steps for this category between BizTalk Server and SAP XI.

- The Orchestration Designer tool provided a better integrated design experience for developers, compared to corresponding tools in SAP XI. There was no need to switch between the tools for performing all the related tasks in BizTalk Server.
- The steps and duration for designing the orchestration and integration processes for consuming the web service were observed to be similar in both integration products.

In general, the comparison of features between both the products for this category was similar to the previous scenario, resulting in completeness ratings of 4.750 for BizTalk Server and 4.5 for SAP XI. The developers noted the time savings of 56.25% for BizTalk Server and 77.27% and fewer steps compared to SAP XI.

- **Development:** Compared to the first scenario, this category consisted of fewer exercises, as there was no need to implement business rules and it did not require generating XSD schema for SQL stored procedures. Also, it did not include direct interaction with the SQL database. Rather, In BizTalk Server, a custom web service was created from the orchestration to update the shipping status in the SQL database, for which developers generated a Web Service Description Language (WSDL) schema by adding a web reference to the BizTalk project. Apart from this, exercises were comparable to the previous scenario. This scenario included fewer schemas, maps, ports, and message variables compared to the previous scenario. The developers were able to complete all the tasks in 36.67 minutes and the exercises were completed in 122 steps.

SAP XI developers also followed similar steps to those in the first scenario, except that they did not have to write custom code to implement business rules. The developers imported the software components and created namespaces in the Integration Repository. They used the wizard-based functionality to import the custom SAP IDoc that contained the updated order shipping status information. Then, developers imported WSDL structures, defined message interfaces, and created message and interface mappings. Finally, they integrated the business process and activated all the objects. The average duration to complete these exercises was 42.33 minutes and 161 steps.

For SAP XI, the development results fared better in this scenario compared to the first scenario. Still, BizTalk Server earned a time savings of 13.37% and 24.22% fewer steps. The lab developers rated both the products as 4.222.

While performing the development tasks for this scenario, the BizTalk Server and SAP XI developers made the following observations:

- Both products provided wizard-based functionality to generate custom IDoc schemas, but the BizTalk Server demonstrated a tighter integration of tools within the Visual Studio development environment. Also, the user navigation experience was better for BizTalk Server developers.
 - BizTalk Server allowed developers to utilize web services from business processes more easily and in fewer steps.
-

Additionally, the following features were described as useful, although they were not directly used for developing the lab scenarios:

- BizTalk Server provides a range of built-in functions to support simple to complex mapping.
 - SAP XI allows creating and reusing templates based on the existing maps.
- **Deployment:** In this category, the lab developers followed exercises analogous to those in Scenario 1. The only difference occurred for SAP XI, as developers did not need to create any sender agreements.

BizTalk Server developers began by deploying the BizTalk solution using the Microsoft Visual Studio 2005 environment. They created physical ports for receiving custom IDocs with modified shipping status from the SAP system, and for sending messages to web services for updating the status in the SQL database. Finally, developers bound these physical ports to the logical ports created in previous exercises for this scenario and started the orchestration using the BizTalk Administration console. Deployment time with BizTalk Server was 18.00 minutes, while the number of steps was 41.

SAP XI developers completed seven exercises to accomplish the tasks related to this category. They first created an integration scenario in Integration Directory and imported business systems, consisting of inbound and outbound interfaces and software component versions from System Landscape Directory (SLD). Developers then created a business service for abstract business entities, and imported the integration process service that was previously created in Integration Repository. Communication channels were developed to send and receive the messages. Developers configured senders and receivers by defining respective receiver determination, interface determination, and receiver agreement steps. As the final exercise in this category for this scenario, they activated all the created objects. This category was consisted of 129 steps and required 30.33 minutes.

The lab developers observed following while performing the exercises for this category in BizTalk Server and SAP XI:

- For SAP XI, an integration scenario had to be created at deployment time, to group all the configuration objects in the integration directory. For BizTalk Server, grouping was automatically done based on the artifacts created in a BizTalk project at the design and development time. There was no need to define a separate grouping at deployment time.
- For deploying the integration process that consumed the web service, SAP XI developers had to create a business service, create communication channels, and configure web services as receivers. For BizTalk Server there were only two tasks which included creating a physical port and binding the same to a logical port.
- Overall SAP XI developers had to perform 7 exercises to deploy the solution. BizTalk Server developers completed the same in 4 exercises. This resulted in increased task duration and higher number of steps for SAP XI.

As in the previous scenario, lab developers observed that both BizTalk Server and SAP XI provided the necessary functionality for deployment; however, there was a major difference in the efficiency of operation in each product. Deployment time savings for this scenario with BizTalk were 40.65% and the number of steps was 68.22% lower. BizTalk Server and SAP XI were respectively rated 4.750 and 4.571 for this category.

- **Testing and Monitoring:** Both BizTalk Server and SAP XI developers used SAP's GUI application to test the deployed solution. Using the VA02 transaction, they modified the shipping status of an existing purchase order. This triggered an IDoc that was processed by each server to update the shipping status in the SQL database.

For monitoring, all developers followed comparable exercises to those in the first scenario. The only difference for SAP XI developers was that they did not have to monitor messages in the SAP XI server.

The developers made following observations while performing the testing and monitoring for this scenario:

- The testing for the scenario in both the products was also performed in the same way as in the first scenario, that is, using the VA02 transaction in the SAP GUI application for modifying the existing sales order.
- BizTalk Server provided an ability to debug the integration process at run time using Health and Activity Tracking (HAT). SAP XI did not provide such capability.
- The observed time savings for BizTalk Server over SAP XI was less than the savings in Scenario 1, as lab developers did not have to monitor the messages in SAP XI.

It took 13.33 minutes for BizTalk Server developers to test and monitor this scenario, just 1 minute, 27 seconds less than for SAP XI. The observed number of steps for BizTalk Server was 31 and 39 for SAP XI. BizTalk Server and SAP XI were rated as 3.250 and 3, respectively.

3. Scenario 3: Synchronous Integration Server - SAP Interaction

Scenario Description: This scenario demonstrates synchronous messaging between an external application and the SAP system via BizTalk Server or SAP XI. The scenario begins when BizTalk Server receives the updated shipping address details (the buyer fills out the form on the website and submits the data) and ends when the shipping address is synchronously updated and the confirmation response from SAP to the external application is received. This scenario uses synchronous messaging through BAPI/RFC calls.

The following steps describe the business flow for this scenario (see Figure 4):

1. The buyer updates the shipping address details for an existing purchase order using a retail marketplace website. The update request is submitted to the supplier's system by sending a web service request to the integration server.
 2. The integration server updates the order in the SAP system.
 3. The SAP system returns the update confirmation to the integration server.
 4. The integration server returns the update confirmation to the retail marketplace.
 5. The retail marketplace website displays the confirmation message to the buyer.
-

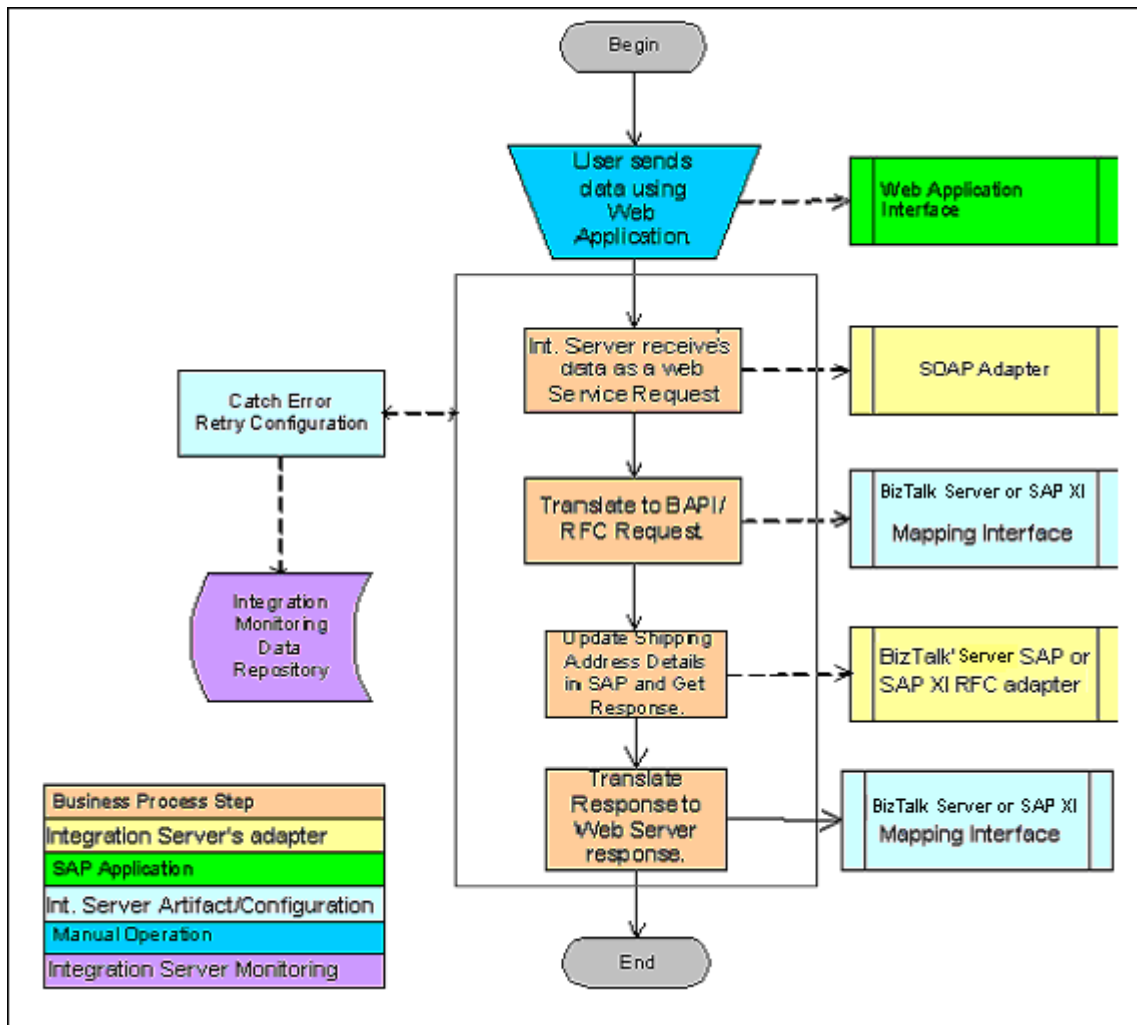


Figure 4: Diagram for Scenario 3 - Synchronous Integration Server - SAP Interaction Scenario

Test Results: This scenario is more technically complex than the previous scenarios and shows higher productivity savings for BizTalk Server. The results are displayed in the table below. The test addresses the server's ability to interact with the enterprise system in real-time mode through BAPI/RFC calls. Overall, it took BizTalk Server 329 steps and SAP XI 416 steps to accomplish this scenario.

	BizTalk Server	SAP XI	BizTalk Server	SAP XI	BizTalk Server	SAP XI
Phase	Average duration in minutes	Average duration in minutes	Number of Steps	Number of Steps	Completeness	Completeness
Design & Modeling	6.33	14.33	24	70	4.500	4.000
Development	61.00	70.33	229	218	4.286	4.300
Deployment	17.00	29.00	55	101	4.750	4.571
Testing & Monitoring	8.67	10.33	21	27	3.250	3.000
Totals	93.00	124.00	329	416	4.196	3.968
% Difference (SAP – BizTalk) SAP	25.00%		20.91%			
Workday Savings	27.97%					

Qualitative Analysis:

- It took 93 minutes for a BizTalk Server developer to complete Scenario 3, 25.00% less time than it took for SAP XI to do the same.
- It took the BizTalk Server developer 20.91% fewer steps than the SAP XI developer to complete this scenario.
- This difference amounts to workday savings of 27.97%, when an integration developer works on the interface in the Scenario 3.

The results for each category are given below.

- **Design and Modeling:** As in previous scenarios, the design and modeling phase consisted of two exercises for BizTalk Server. The developers first created a new BizTalk project in the Microsoft Visual Studio 2005 environment, and designed the BizTalk orchestration using the Orchestration Designer tool. They were able to accomplish all design and modeling tasks in 24 steps, taking 6.33 minutes.

For SAP XI, developers started by creating product and software components and associating software components to the product using the System Landscape Directory (SLD) tool. They created technical and business systems and bound those to each other, using the SLD tool. Finally, developers designed the integration process, representing the business process, using SAP XI's Integration Builder tool. The SAP XI developers completed the tasks, consisting of 70 steps, in an average duration of 14.33 minutes.

The developers made following observations while performing the design and modeling for this scenario:

- There was no difference between the numbers of exercises for both BizTalk and SAP XI servers in this and the previous scenarios.
- For BizTalk Server and SAP XI, the steps for this category were slightly different compared to asynchronous scenarios as the communication pattern

with SAP system was different. BizTalk Server developers included additional send or receive shapes in the orchestration to facilitate bi-directional information exchange. For SAP XI, the developers specified the synchronous communication mode by setting properties for the integration process step.

- The developers found BizTalk Server to be more efficient for designing the business process for this synchronous scenario, as was the case for asynchronous scenarios due to Visual Studio's more intuitive UI and plug-ins.

The comparison of features between the products for this category was also similar to the previous scenario so the completeness ratings were also the same: 4.750 for BizTalk Server and 4.5 for SAP XI. The developers noted a time savings of 55.83% for BizTalk Server and 65.71% fewer steps.

- **Development:** Development tasks were grouped into nine exercises for BizTalk Server. The developers began by generating XSD schemas for the standard RFCs used to update the shipping address details synchronously, and created custom schemas to send and receive messages to and from external web applications. They followed by creating maps using the BizTalk Mapper tool for transforming the messages from one format to another. They defined the message variables for the messages flowing through the system and created logical ports in the orchestration. Then they integrated the business process, which included connecting the logical ports with their respective shapes in the orchestration and writing expressions for reusing the SAP connections made from BizTalk Server. Finally, developers compiled the BizTalk project into a BizTalk assembly. The developers finished all the development tasks for this scenario in an average of 61 minutes and 229 steps.

For SAP XI, this category consisted of ten exercises. As in the previous scenarios, the developers first imported software components created in System Landscape Directory and created namespaces to avoid naming conflicts. They imported the schema for RFC used for updating the shipping address details using the wizard-based functionality in the Integration Builder. The developers defined data types, message types, message interfaces, message mappings and interface mappings for sending and receiving messages from external web application, and sending messages to the SAP system. They integrated the business process, including assigning the abstract messages to receive, transform, and send shapes of the integration process. Finally, the developers activated all the created objects. The average duration was 70.33 minutes and 218 steps to complete these exercises.

The developers made the following observations while developing the solution using BizTalk Server and SAP XI:

- This scenario utilized BAPI calls for performing the synchronous operations, as opposed to using IDocs for performing asynchronous operations in previous scenarios.
 - The process for generating schemas and mapping for RFCs in BizTalk Server and SAP XI was similar to the same process in IDocs. The developers used the same set of tools to perform these tasks.
 - Even though BizTalk Server developers had to make an additional BAPI call, not required in SAP XI, to explicitly commit the changes demanded by the sales order change, the overall duration was less for BizTalk Server. The impact of this additional BAPI call is less in complex scenarios, where a
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single commit BAPI call can be made for multiple updates of BAPI calls to modify data in the SAP system.

- For the first time, SAP XI showed better results for the number of steps for this category. This difference was due to an additional BAPI call in BizTalk Server, as opposed to a simplified configuration needed in SAP XI for committing the changes.

SAP XI tasks were completed in 5.05% fewer steps. However, the total time savings for BizTalk Server was 13.27% less than SAP XI. The assigned completeness ratings to BizTalk Server and SAP XI were 4.286 and 4.3 for this category.

- **Deployment:** In this category, BizTalk Server developers deployed the BizTalk solution in the Microsoft Visual Studio 2005 environment. They created physical ports for sending and receiving messages from external web application and sending messages to the SAP system. Finally, developers bound these physical ports to the logical ports created in previous exercises, and started the orchestration using the BizTalk Administration console. Deployment time with BizTalk Server was 17 minutes, in 55 steps.

SAP XI developers completed seven exercises to accomplish the tasks related to this category. They first created an integration scenario in the Integration Directory and imported business systems, consisting of inbound and outbound interfaces and software component versions, from the System Landscape Directory (SLD). They created a business service for abstract business entities and imported the integration process service previously created in the Integration Repository. Communications channels were created in order to send and receive the messages. Then the developers configured senders and receivers by defining respective receiver determination, interface determination, and receiver agreement steps. As the final exercise in this category for this scenario, the developers activated all the objects. This category took 101 steps and required 29 minutes for SAP XI.

As in previous scenarios, lab developers observed that both BizTalk Server and SAP XI provided the necessary functionality for deployment. Below are some observations made by the developers for this scenario:

- The deployment exercises followed for this scenario in both BizTalk Server and SAP XI were similar to the previous scenario.
- However, the steps were slightly different for this synchronous scenario, compared to the asynchronous one. The BizTalk Server developers created bidirectional physical ports for this scenario. The steps for deploying the solution, binding, and physical ports, and enlisting and starting the orchestration were all similar to asynchronous scenarios. SAP XI developers implemented the same processes by using the RFC adapter instead of the IDoc adapter.
- BizTalk Server demonstrated better developer productivity as developers were able to complete the tasks in less time and fewer steps.

The completeness scores for BizTalk Server and SAP XI in this category were 4.750 and 4.571, respectively. Deployment time savings for this scenario with BizTalk Server were 41.38% and the number of steps was 45.54% less.

- **Testing and Monitoring:** Both BizTalk Server and SAP XI developers used custom web applications to test the deployed solution. The application allowed developers to view the existing orders retrieved from a SQL database (created in the first scenario). The
-

developers selected an order and updated the shipping information. Upon filling new address details and submitting the web form, the business process in the integration was invoked, which updated the address details for the respective purchase orders in the SAP system.

The developers made following observations while testing and monitoring the solution for this scenario:

- o The testing of the solution for both products was the same as for the previous scenario. The developers used custom web applications to submit the update requests for the order shipping address to the respective integration servers and to receive the response to be viewed by the user.
- o For monitoring, even though both developers followed comparable exercises, the number of steps was slightly different as it included bidirectional communication for both servers. Also, it was noticed that BizTalk Server provided a capability for entering better search criteria for finding a particular message, as well as displaying more details about the messages and business process flow compared to SAP XI.

BizTalk Server developers were able to accomplish all testing and monitoring tasks in 21 steps, taking 8.67 minutes. SAP XI developers had to spend 2 minutes more, with a total of 10.33 minutes and 27 steps. The assigned completeness ratings to BizTalk Server and SAP XI were 3.250 and 3.000.

4. Savings in the Lab Environment

Once the savings in duration for all scenario categories was measured, the figures were adjusted to account for the relative weight of each category according to the following formula:

$$\text{Workday Savings for a Category} = \text{Time Saving for Category} * \text{Workload Weight} = (1 - \text{Duration for Product 1} / \text{Duration for Product 2}) * \text{Workload Weight for the Category}$$

Crimson calculated the workday saving for each category by adding them up to find the total workday saving for a scenario. Analysts then calculated the productivity savings for each category by multiplying the developer's median annual compensation on the time saving for durations of BizTalk Server and SAP XI scenarios:

$$\text{Productivity Savings for a Scenario} = \text{Annual Compensation} * \text{Total Workday Savings for a Scenario}$$

The following table displays the annual savings for each lab scenario using BizTalk Server:

Scenario	Average Workday Savings. In %	Annual Productivity Saving, in dollars	Annual Cost Savings, in dollars
1	40.57%	\$48,684	\$78,187
2	26.99%	\$32,350	
3	27.97%	\$33,567	

B. APPLICABILITY OF LAB SCENARIOS IN DEVELOPER ENVIRONMENT

Crimson considers that results will differ slightly in real-world situations, but that these differences will tend to benefit the enterprise, depending on the environment. For testing purposes, the number of integration interfaces was only one per scenario. However, in an enterprise situation,

the number of interfaces will vary. It is reasonable to expect that the larger the organization, the greater the number of interfaces that may be developed on an annual basis. Savings will therefore increase substantially in such multi-interface situations.

For example, developers in a typical mid-sized organization may create 15 integration interfaces per year for a single SAP instance. The organization may use an integration server running on two to three BizTalk servers that use four CPUs in total. Similarly, in the case of a large-sized organization, we can assume a case of 30 integration interfaces per year on four to six BizTalk servers, using eight CPUs in total.

Using examples of mid-sized and large-sized organizations, with integration interfaces similar to the scenarios tested in our study, we can expect the following savings:

- The expected productivity savings for both mid-sized and large-sized organizations are expected to vary between 26.96% and 40.57%.
 - For mid-sized organizations, the savings in dollars are expected to range from \$485,252 to \$730,323.
 - For large-sized organizations, savings in dollars are expected to range from \$970,503 to \$1,460,646.
- Cost savings in software licensing for mid-sized and large-sized organizations are expected to range from 72.2%¹¹ to 83.7%, respectively.¹²
 - The corresponding savings in dollars are expected to range from \$624,040 to \$1,234,600.
 - The application-specific adapters, included with BizTalk Server at no additional cost, may drive cost savings even higher.
 - Administration savings related to ongoing IT support and maintenance may increase significantly as the cost of multiple integration servers is removed from the IT budget.

See **Appendix 2** for a more complete analysis of cost and savings factors using these calculations.

C. APPLYING DEVELOPER PRODUCTIVITY COST SAVINGS TO OTHER HETEROGENEOUS ENVIRONMENTS

Since the SAP NetWeaver platform and its XI middleware component are commonly used as an integration platform for mySAP and the legacy SAP systems, Crimson selected mySAP ERP for the purposes of lab testing.

In lab testing conducted using common integration scenarios, BizTalk Server proved to be a more suitable solution than SAP XI for integration of SAP solutions in a heterogeneous environment, due to better cost and productivity savings. Some of the causes of these savings include:

- A wide range of default connectivity adapters that come with BizTalk Server. The availability of these adapters leads to significant cost savings, as third-party connectivity adapters can be costly.
- A tight integration with the Visual Studio development environment that simplifies the overall design and development process with BizTalk Server and leads to significant productivity savings.

¹¹ The mid-size scenario assumes low-to-mid transactional volume up to 50GBytes per month.

¹² The large-size scenario assumes high transactional volume from 250GBytes up to 500GBytes per month.

- The ability to use predefined design templates to quickly post the most popular scenarios online, which may lead to additional productivity savings in some cases.

Developer productivity savings observed in the lab environment from using BizTalk Server apply to a much wider group of enterprise solutions, where availability of adapters and simplicity of development are often seen as the main cost and productivity drivers. As a result, integration of external applications, using the BizTalk Server platform, extends to many popular business enterprise solutions, such as Siebel, PeopleSoft, and Oracle, yielding significant cost and productivity savings. Consider the following examples:

- An industrial manufacturing company that uses Oracle Financials for ERP planning needs to streamline its business processes and integrate more than eight disparate systems—including financial, HR, and manufacturing—used by several thousand employees in different geographic locations.

As some parts of the company may have been using the Microsoft .NET Framework, selection of BizTalk Server comes as a natural choice, as it allows achieving integration goals at a minimum expense due to lower pricing, as well as significantly improving developer productivity at the same time:

- Similar to Lab Scenario 1, in this customer example, integration interfaces for internal enterprise application integration (EAI) can be simplified if the prebuilt design templates are used to connect all disparate systems. In fact, we can expect that productivity may be higher, since Lab Scenario 1 explored a generic order placement, typically found in any enterprise environment.
 - Reduced costs and improved productivity savings result from BizTalk Server's Business Rules Engine, which eliminates additional design and modeling tools.
 - As demonstrated in the lab environment, development in BizTalk Server can be done efficiently using the same set of tools, Visual Studio 2005, used for .NET Framework components. Integration interfaces can be created quickly without any additional training.
- A food products company relies on a number of external partners scattered across North America in their supply chain to produce, distribute, and sell its products. Among their suppliers are the raw materials providers, which deliver ingredients for the company's products. There are also packaging partners—the assembly line that puts together the products and ships it out to distribution centers.

Many of the company's trading partners have their own ERP systems, so that duplicate data are often entered into the company's ERP system, leading to operational ineffectiveness. BizTalk Server can help overcome this problem and achieve the following savings:

- As an integration platform, BizTalk Server supports significant savings by shipping with a wide range of default adapters that can be used to connect to external partners' business solutions. These use various open industry standards such as SOAP, XML, EDI, and RosettaNet, leading to significant savings.
 - As in the Lab Scenario 3, the synchronous exchange with data between different partners can be orchestrated via web services supported by BizTalk Server, requiring little or no custom coding. Such an approach offers significant productivity savings and simplifies the subsequent maintenance of these integration solutions. Additionally, the productivity savings observed in the
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customer case would be comparable with the ones observed in the lab scenarios, and in certain cases will surpass them

- As shown in Lab Scenario 1, BizTalk Server's integration with other Microsoft server technologies such as IIS allows rapid deployment of the newly developed web services, reducing the overall time needed to create such a scenario. This can result in the additional productivity savings in certain cases.

D. ADDITIONAL FINDINGS

Other factors play an important role in the selection of the BizTalk Server over SAP XI in major enterprises. Developers in these organizations identify the following business and technical issues as crucial reasons for choosing a BizTalk Server deployment:

- Microsoft BizTalk Server is an integration solution designed to connect a wide variety of internal and external systems into an SOA that supports partner, vendor, and customer collaboration interaction. With over 6,000 customers, BizTalk Server is used by 50% of the Fortune 100, 40% of the Global 100, and 30% of the Fortune 500 companies.
- The Crimson study demonstrated a clear improvement in developer productivity with its built-in integration with Microsoft technologies such as Visio, Microsoft Office applications such as Excel, and the Visual Studio development system. BizTalk Server release cycles are synchronized with other software solutions from Microsoft such as Visual Studio, as opposed to SAP XI which needs to be manually integrated with third-party IDE solutions.
- Microsoft BizTalk Server has received high ratings for its ease of use from independent analysts.¹³
- Because it ships from Microsoft with more than 20 adapters, and with more than 150 adapters from third-party vendors, Microsoft BizTalk Server can function as the integration hub for heterogeneous systems in the enterprise environment. Its adapters can be classified into two groups: technology adapters and application adapters. The technology adapters establish connectivity to various databases, message queuing products, etc., while the application adapters provide connectivity to business applications such as JD Edwards, Siebel, PeopleSoft, SAP and Oracle.
- Following is a list of the adapters that are part of BizTalk Server 2006: Base EDI, BizTalk Message Queuing (MSMQT), File, FTP, HTTP, MQSeries, MSMQ, POP3, BizTalk Adapter v2.0 for mySAP Business Suite, SMTP, SOAP, SQL, Windows SharePoint Server, BizTalk Adapter for JD Edwards OneWorld, BizTalk Adapter for JD Edwards EnterpriseOne, BizTalk Adapter for Oracle Database, BizTalk Adapter for PeopleSoft Enterprise, BizTalk Adapter for Siebel eBusiness Applications, BizTalk Adapter for TIBCO Rendezvous, BizTalk Adapter for TIBCO Enterprise Message Service, BizTalk Adapter for DB2¹⁴, BizTalk Adapter for WebSphere¹⁷, BizTalk Adapter for Host Files¹⁷, BizTalk Adapter for Host Applications¹⁷.
- BizTalk Server can scale for high-volume messaging by supporting cluster configurations that require no additional programming.
- BizTalk Server's ability to make use of previous IT investments can help enterprises significantly reduce TCO for business integration in heterogeneous environments. For example, BizTalk Server can employ an existing mySAP ERP production environment with its high-performance SAP adapter. No upgrade of the existing SAP R/3 Enterprise production environment is required.

¹³ http://www.infoworld.com/Microsoft_BizTalk_Server_2004/product_46693.html?view=1&curNodeId=0

¹⁴ Included as part of the Microsoft BizTalk Adapters for Host Systems releasing H2 CY 2006

CONCLUSION

This study clearly demonstrates that BizTalk Server enables greater TCO over the SAP XI middleware offering for integrating with external systems. Both productivity and operational cost savings are accrued in a head-to-head comparison between the two products, and BizTalk Server also offers a variety of features, connectivity adapters, and GUI tools to enhance monitoring and administration of the integration server.

These findings as tested in the lab can be extended into the real-world enterprise environment, where similar technologies are used. The estimated savings for mid-sized and large-sized organizations are based on Crimson models and independently confirm the results observed by the Crimson team in the lab environment. It is therefore possible to conclude that using Microsoft BizTalk Server, rather than SAP XI in integrating SAP R/3 in heterogeneous environment, offers a strong incentive for organizations that wish to make use of their previous investment in SAP technology without undergoing the costs associated with a major upgrade.

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APPENDICES

APPENDIX 1: OVERVIEW OF THE LAB SCENARIOS

Scenario 1

This scenario simulates B2B integration between a retailer's marketplace website and its supplier's internal systems. Upon placing a new order, the retail marketplace website sends the purchase order information to the integration server (SAP XI or BizTalk Server) in flat file format. The supplier uses an SAP ERP system for order processing and maintains the order data in a Microsoft SQL Server database. The integration product acts as middleware between the retail application and the supplier's internal systems. The integration server also determines the business process flow based on defined business rules.

Test Results:

	BizTalk Server	SAP XI	BizTalk Server	SAP XI	BizTalk Server	SAP XI
	Average duration in minutes	Average duration in minutes	Number of steps	Number of steps	Completeness	Completeness
Totals	184.67	273.67	739	1774	4.175	3.960

Scenario 2

This scenario is built around shipment tracking for a placed order and demonstrates sending data from the SAP system to the integration server asynchronously. The SAP system sends messages to external systems using the IDoc adapter. In this scenario, the SAP system triggers an IDoc call when the SAP business user updates the shipping status of an existing purchase order, using standard VA02 transactions in the SAP system. The integration server receives the generated IDoc request, processes it, and updates the different external systems. The external system in this scenario is the Microsoft SQL Server database, which is updated using a custom web service.

Test Results:

	BizTalk Server	SAP XI	BizTalk Server	SAP XI	BizTalk Server	SAP XI
	Average duration in minutes	Average duration in minutes	Number of steps	Number of steps	Completeness	Completeness
Totals	75.00	103.66	214	417	4.181	3.948

Scenario 3

This scenario studies messaging between mySAP ERP and a retail online marketplace and demonstrates synchronous messaging between an external application and an SAP system via BizTalk Server or SAP XI. The scenario begins when BizTalk Server receives the updated shipping address details (a user fills out the form on the website and submits the data) and ends when the shipping address is synchronously updated and the confirmation response from SAP to the external application is received. This scenario utilizes synchronous messaging through BAPI/RFC calls.

Test Results:

	BizTalk Server	SAP XI	BizTalk Server	SAP XI	BizTalk Server	SAP XI
	Average duration in minutes	Average duration in minutes	Number of Steps	Number of Steps	Completeness	Completeness
Totals	93.00	124.00	329	416	4.196	3.968

APPENDIX 2: OVERVIEW OF THE TCO FRAMEWORK FOR THE LAB ENVIRONMENT

COST DRIVERS
Cost of Pricing and Licensing for BizTalk Server Enterprise version
Cost of Pricing and Licensing for SAP XI (annual price)
BizTalk Adapter v2.0 for mySAP Business Suite
BizTalk SQL Adapter
BizTalk SOAP Adapter
BizTalk SMTP Adapter
BizTalk File Adapter
SAP XI IDOC Adapter
SAP XI JDBC Adapter
SAP XI SMTP Adapter
SAP XI RFC Adapter
SAP XI Flat File Adapter
Cost of design and development tools (if needed)
PRODUCTIVITY DRIVERS
Design and Modeling
Development
Deployment
Testing and Monitoring

FORMULA FOR TCO CALCULATION FOR THE LAB SCENARIOS

Total Savings = Cost Savings + Productivity Savings

Cost Savings = Cost of BPMS platform (BizTalk Server Enterprise Edition or SAP XI) + Cost of adapters¹⁵ + Cost of Development Tool (Visual Studio 2005 Professional Edition)

Productivity Savings = (Workday Savings for Design and Modeling + Workday Savings for Development + Workday Savings for Deployment + Workday Savings for Testing and Monitoring) * Annual Developer's Compensation

¹⁵ All adapters used in the lab environment are included free with both products

THE TCO CALCULATION FOR THE LAB SCENARIOS

Currency Exchange Rate					Included in BizTalk Server 2006 license
1.2109					The cost of BizTalk Server 2006 Enterprise Edition
					The cost of Visual Studio 2005 Professional Edition
Developer's Annual Compensation					
\$120,000					
COST DRIVERS					
		BizTalk-related costs	SAP XI-related cost		
BPMS					
Licensing cost for BizTalk Server 2006 Enterprise Edition		\$29,995	Not applicable		
Licensing cost for SAP XI		Not applicable	\$108,981		
Cost of adapters (SAP to BizTalk, SAP to Microsoft SQL Server, etc.):					
BizTalk Adapter v2.0 for mySAP Business Suite		0	Not applicable		
BizTalk SQL Adapter		0	Not applicable		
BizTalk SOAP Adapter		0	Not applicable		
BizTalk SMTP Adapter		0	Not applicable		
BizTalk File Adapter		0	Not applicable		
SAP XI IDOC Adapter		Not applicable	0		
SAP XI JDBC Adapter		Not applicable	0		
SAP XI SMTP Adapter		Not applicable	0		
SAP XI RFC Adapter		Not applicable	0		
SAP XI Flat File Adapter		Not applicable	0		
Cost of design and development tools (if needed)		\$799	0		
Cost of Management		0	0		
MOM Server License		0	0		
Managed Devices		0	0		
BAM		0	0		
EDI		0	0		
Message Queuing		0	0		
Application Server		0	0		
Totals		\$30,794	\$108,981	72%	
COST SAVINGS		\$78,187			

Note 1: Data on SAP XI licensing data are based on the information shared by SAP customers, based on a maximum usage of up to 50GBytes per month.

Note 2: The development tools include Visual Studio 2005 Professional Edition and a free generic Java IDE environment for SAP XI

PRODUCTIVITY SAVINGS						
	Scenario 1		Time Savings	Workday Savings	Annual Savings	
	Average Duration for BizTalk	Average Duration for SAP XI				
Scenario Phases	In minutes	In minutes	In %	In %	In \$	
Design and Modeling	8.33	22.33	63%	12.54%	\$15,045	
Development	146.67	182.00	19%	7.77%	\$9,319	
Deployment	21.00	55.00	62%	12.36%	\$14,836	
Testing and Monitoring	8.67	14.33	40%	7.91%	\$3,488	
Totals	184.67	273.67				
% Difference in Duration	32.52%					
Workday Savings Totals				40.57%		
Productivity savings, in \$					\$48,688	
TOTAL COST AND PRODUCTIVITY SAVINGS					\$126,875	
Total Savings (Scaled Up Productivity savings multiplied by the Number of interfaces), in \$						
Number of Interfaces		15			\$730,322.90	

PRODUCTIVITY SAVINGS					
Scenario Phases	Scenario 2		Time Savings	Workday Savings	Annual Savings
	Average Duration for BizTalk	Average Duration for SAP XI			
	In minutes	In minutes	in %	in %	in \$
Design and Modeling	7.00	16.00	56%	11.25%	\$13,500
Development	36.67	42.33	13%	5.35%	\$6,425
Deployment	18.00	30.33	41%	8.13%	\$9,758
Testing and Monitoring	13.33	15.00	11%	2.22%	\$2,667
Totals	75.00	103.67			
% Difference in Duration	27.65%				
Workday Savings Totals				26.96%	
Productivity savings, in \$	\$32,350				
TOTAL COST AND PRODUCTIVITY SAVINGS	\$110,537				
Total Savings (Scaled Up Productivity savings multiplied by the Number of interfaces), in \$			\$485,251.58		
Number of Interfaces	15				

PRODUCTIVITY SAVINGS					
Scenario Phases	Scenario 3		Time Savings	Workday Savings	Annual Savings
	Average Duration for BizTalk	Average Duration for SAP XI			
	In minutes	In minutes	in %	in %	in \$
Design and Modeling	6.33	14.33	56%	11.16%	\$13,395
Development	61.00	70.33	13%	5.31%	\$6,370
Deployment	17.00	29.00	41%	8.28%	\$9,931
Testing and Monitoring	8.67	10.33	16%	3.23%	\$3,871
Totals	93.00	124.00			
% Difference in Duration	25.00%				
Workday Savings Totals				27.97%	
Productivity savings, in \$	\$33,567				
TOTAL COST AND PRODUCTIVITY SAVINGS	\$111,754				
Total Savings (Scaled Up Productivity savings multiplied by the Number of interfaces), in \$			\$503,505.29		
Number of Interfaces	15				

APPENDIX 3: OVERVIEW OF THE TCO FRAMEWORK FOR MID-SIZED AND LARGE-SIZED CUSTOMER ORGANIZATIONS

COST DRIVERS	FORMULA COMPONENTS
Setup and Installation Expenses	
Cost of installation of integration platform	= Number of resource * hours spent * employee hourly rate
Cost of infrastructure upgrade (for example, SAP R/3 has to be upgraded to mySAP, which currently has a marginal market share)	= Number of resource * hours spent * employee hourly rate
Professional Services	= Number of consultants * hours spent * consultant's hourly rate
Ongoing Expenses	
Cost of integration servers' pricing and licensing	=Cost of BizTalk Server Enterprise Edition or SAP XI software ¹⁶ * number of servers installed
Cost of adapters pricing and licensing (from SAP to non-SAP solutions)	
Technology adapters:	
BizTalk Adapter v2.0 for mySAP Business Suite	Included free-of-charge
BizTalk SQL Adapter	Included free-of-charge
BizTalk SOAP Adapter	Included free-of-charge
BizTalk SMTP Adapter	Included free-of-charge
BizTalk File Adapter	Included free-of-charge
SAP XI IDOC Adapter	Included free-of-charge
SAP XI JDBC Adapter	Included free-of-charge
SAP XI SMTP Adapter	Included free-of-charge
SAP XI RFC Adapter	Included free-of-charge
SAP XI Flat File Adapter	Included free-of-charge
Application adapters:	
Siebel adapter	=Cost of adapter (free for BizTalk Server, 50,000 euros for SAP XI)
JD Edwards adapter	=Cost of adapter (free for BizTalk Server, 50,000 euros for SAP XI)
Cost of third-party solutions' licensing for integration project (Design Suite, Rules Engine, Reporting) if needed	=Cost of Visual Studio 2005 Professional Edition (or similar tool for SAP XI) * number of seats
Product Support (Cost of integration system support on 5-year schedule as a percentage of the project budget)	= 10%* Cost of 1 BPMS Server *24:24Number of Installed Servers
Administration and Support	
Cost of initial administration (initial creation of production scripts and routines)	= time in hours needed to create scripts * number of developers * developers hourly rate

¹⁶ The large-size scenario assumes high transactional volume from 250GBytes up to 500GBytes per month.

Cost of ongoing IT support (problems escalated to developers)	= number of problems per month escalated to developers * number of developers involved into this * developer's monthly compensation
COST SAVINGS	
The components above calculated for BizTalk Server and for SAP XI.	
Note: In mid-sized and large-sized customer's scenarios we calculate the cost savings as the difference between ongoing expenses between BizTalk Server and SAP XI. The other components cannot be estimated for both scenarios, however they can be used for a real-life calculation if the customer has this information. The cost savings are calculated for 1-year period.	
PRODUCTIVITY SAVINGS	
Design and Modeling Savings	
Observed savings in duration and number of resources	= Saved time * number of developers * developers annual compensation + reduced headcount * developers annual compensation
Development Savings	
Observed savings in duration and number of resources	= Saved time * number of developers * developers annual compensation + reduced headcount * developers annual compensation
Deployment Savings	
Observed savings in duration and number of resources	= Saved time * number of developers * developers annual compensation + reduced headcount * developers annual compensation
Testing Savings	
Observed savings in duration and number of resources	= Saved time * number of developers * developers annual compensation + reduced headcount * developers annual compensation
Monitoring Savings	
Observed savings in duration and number of resources	= Saved time * number of developers * developers annual compensation + reduced headcount * developers annual compensation
Administration and Support	
Cost of ongoing software maintenance	= number of patches or hotfixes applied per month + number of developers involved into this * developer's monthly compensation
Cost of IT support	= time spent to do the IT support a week * Number of developers * developers weekly compensation
PRODUCTIVITY SAVINGS	
the components above calculated for BizTalk Server and for SAP XI	

Note: In mid-sized and large-sized customer's scenarios we calculate the productivity savings as the difference between savings for Design and Modeling, Development, Deployment, and testing and Monitoring categories for BizTalk Server and SAP XI. The other components are not included due to the inability to estimate them in the lab Environment. However, they can be used for a real-life calculation if the customer has this information. The productivity savings are calculated for one-year period.

EXAMPLE OF TCO CALCULATION FOR A MID-SIZED CUSTOMER SCENARIO

The formulas used for calculations in the table below, are listed in the beginning of Appendix 3. In all cases where information was not available it is marked as "N/A."

TCO MODEL

Number of Integration Interfaces	15
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SAVINGS OBSERVED BY THE CUSTOMERS

COST SAVINGS		
	BIZTALK	SAP XI
Set-Up and Installation Expenses		
Cost of installation of integration platform	\$288,000	
Cost of infrastructure upgrade (for example, SAP R/3 has to be upgraded to mySAP that currently has a marginal market share)	\$0	
Professional Services	\$0	
Subtotals	\$288,000	\$0
Ongoing Expenses		
Integration servers software licensing costs	\$239,960	\$864,000
Cost of technology adapters' software licensing (from SAP to non-SAP solutions)		
Cost of application adapters' software licensing (from SAP to non-SAP solutions)	\$0	\$0
Cost of third-party adapters' software licensing for integration project if needed	\$0	\$0
Product Support (Cost of integration system support on 5-year schedule as a percentage of the project budget)	\$14,998	\$54,000
Subtotals	\$239,960	\$864,000
COST SAVINGS ON INTEGRATION SERVERS SOFTWARE LICENSING		\$624,040
PRODUCTIVITY SAVINGS		
	Savings for Customer's Observed Durations	Workday Savings
Design and Modeling	\$216,000	12.00%
Development	\$135,000	7.50%
Deployment	\$180,000	10.00%
Testing and Monitoring	\$90,000	5.00%
Cost of ongoing IT support (problems escalated to developers)	43200	
Cost of administrative support	720	
Subtotals	\$664,920	
PRODUCTIVITY SAVINGS		\$621,000
TOTAL COST AND PRODUCTIVITY SAVINGS		\$1,245,040

EXAMPLE OF TCO CALCULATION FOR A LARGE-SIZED CUSTOMER SCENARIO

The formulas used for calculations in the table below, are listed in the beginning of Appendix 3. In all cases where information was not available it is marked as "N/A."

TCO MODEL		
Number of Integration Interfaces	30	
SAVINGS OBSERVED BY THE CUSTOMERS		
COST SAVINGS		
	BIZTALK	SAP XI
Set-Up and Installation Expenses		
Cost of installation of integration platform	\$288,000	
Cost of infrastructure upgrade (for example, SAP R/3 has to be upgraded to mySAP that currently has a marginal market share)	\$0	
Professional Services	\$0	
Subtotals	\$288,000	\$0
Ongoing Expenses		
Integration servers software licensing costs	\$239,960	\$1,474,560
Cost of technology adapters' software licensing (from SAP to non-SAP solutions)		
Cost of application adapters' software licensing (from SAP to non-SAP solutions)	\$0	\$0
Cost of third-party adapters' software licensing for integration project if needed	\$0	\$0
Product Support (Cost of integration system support on 5-year schedule as a percentage of the project budget)	\$14,998	\$54,000
Subtotals	\$239,960	\$1,474,560
COST SAVINGS ON INTEGRATION SERVERS SOFTWARE LICENSING	\$1,234,600	
PRODUCTIVITY SAVINGS		
	Savings for Customer's Observed Durations	Workday Savings
Design and Modeling	\$432,000	12.00%
Development	\$270,000	7.50%
Deployment	\$360,000	10.00%
Testing and Monitoring	\$180,000	5.00%
Cost of ongoing IT support (problems escalated to developers)	43200	
Cost of administrative support	720	
Subtotals	\$1,285,920	
PRODUCTIVITY SAVINGS	\$1,242,000	
TOTAL COST AND PRODUCTIVITY SAVINGS	\$2,476,600	

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