



Countrywide Increases Productivity for Tax Bill Procurement by 25 Percent

Overview

Country or Region: United States

Industry: Financial Services

Customer Profile

Countrywide Financial Corporation provides financial services to consumers and businesses. As of May 2005, its Countrywide Tax Services Corporation (CTSC) unit managed real estate taxes for about 5.4 million domestic mortgage loans.

Business Situation

CTSC wanted to better integrate and streamline the process of obtaining tax bills, which were inadequately addressed in its prior solution.

Solution

CTSC used Microsoft® BizTalk™ Server 2004 to build an integration layer and workflow solution that helped automate processes and integrate with other systems while continuing to use its old application for back-office processing.

Benefits

- 4 of 56 technicians freed to do other jobs
- 25 percent productivity increase for remaining users
- 25 percent decrease in cycle times
- 365-hour reduction in planning time (year-to-date)

“Our new solution based on Microsoft .NET is helping us improve efficiency through process automation, support for workflows and work queues, and improved planning and reporting.”

Paramjit Chumber, Senior Vice President and Chief Information Officer, Countrywide Tax Services Corporation

To improve the efficiency of tax bill procurement, Countrywide Tax Services Corporation (CTSC) moved its Procurement Exception Processing System to the Microsoft® Windows® platform. Developed using the Microsoft Visual Studio® .NET 2003 development system and the .NET Framework, the solution provides several new features designed to increase business efficiency, including work planning and allocation tools, support for workflows and work queues, and automatic procurement of some tax bills. Moreover, the integration and process automation capabilities of the solution can be reused for other applications, and allows CTSC to continue connecting its systems and automating processes as it migrates other applications.



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Situation

Countrywide Tax Services Corporation (CTSC), a wholly owned subsidiary of Countrywide Financial Corporation, manages real-estate taxes for approximately 5 million of the 6 million domestic mortgage loans serviced by Countrywide Home Loans (CHL). That tax management role includes establishing and maintaining relationships with tax authorities, obtaining tax bills for properties on which CHL holds a mortgage, and ensuring that those taxes are paid in time.

In 2004, CTSC decided to move the majority of its business applications from an IBM AS/400 system to the Microsoft® Windows® operating system—an initiative designed to reduce the company’s technology expenditures. The company plans to develop all new applications on Windows, and gradually move some critical business processes off the AS/400.

As part of that initiative, CTSC moved its Procurement Exception Processing System (PEPS) to Windows. Used by some 80 employees, the application supports the procurement of tax bills for newly acquired mortgages—loans that closed too late for the required data to be included in the latest electronic bulk update of that data, which the company receives a few times a year. Depending on which of the 33,000 domestic real-estate tax authorities that a property falls under, the means of processing those “procurement exceptions” can include looking up the required data in an internal database or on a public Web site, making a phone call, sending a fax, or scheduling a physical visit by a CTSC representative.

With the prior application, all procurement exceptions were processed manually—even when the required data was present in another internal system. In addition, the application had a text-based user interface (UI) and lacked basic workflow and work

queue features, and provided little more than the information on properties for which tax bills were needed and some fields to enter the required data after it was manually retrieved. Further, CTSC had to run reports at the start of each day to determine what work needed to be done—and run additional reports at the end of each day to ascertain who had done what and which work was not complete.

Because the original application was used only to service Countrywide Home Loans, it was tightly coupled with other similar applications. CTSC had to decouple its new Windows-based PEPS solution from the remaining applications, yet still integrate with them.

“We need to isolate and automate our business processes in a way that still lets us easily plug into the workflows and business processes of our customer,” says Paramjit Chumber, Senior Vice President and Chief Information Officer at Countrywide Tax Services. “To do so, we need to integrate at two levels: between business processes and within those processes at the workflow level. We also need good visibility into those processes so that we can quickly identify and resolve any bottlenecks.”

Solution

The new Procurement Exception Processing System, a Web-based solution built on Microsoft .NET connection software, helps reduce the time and costs associated with the procurement of missing tax bills. Developed in three months with assistance from Xavor, a Microsoft Certified Partner, the new solution integrates with the IBM AS/400, as well as with other internal data stores. The flexible architecture also allows the new processing system to easily connect with other systems.

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New Capabilities to Streamline Processing

The solution facilitates tax bill procurement exception processing for CTSC, and helps process about 30,000 exceptions each month. Exception data passes from the AS/400 to the PEPS solution on a nightly basis and, as exceptions are resolved, newly obtained tax bill data goes to the AS/400 in near real time. To streamline processing, CTSC added several features that were not part of the previous application:

- **Automatic resolution.** Upon receiving data from the AS/400 on those mortgages that need tax bills, the PEPS solution can be programmed, first, to attempt to resolve each exception automatically—by connecting with a second internal system using Web services. If the desired data is found, PEPS can retrieve it and pass the information to the AS/400, thus resolving the procurement exception without the need for attention by a technician. (Note, however, this feature is currently in test and has not been activated.)
- **Work queue management.** If the exception cannot be resolved automatically, the PEPS solution has been designed to intelligently route the exception to one of several work queues for manual processing, taking into account technician skill levels and criteria such as state or payee. Technicians can interact with PEPS through its Web-based UI and, therefore, can move work between queues when required.
- **Planning and reporting.** The PEPS solution provides new capabilities that help the company's procurement unit to better manage its workload. Features include tools for the allocation of work among queues, the capability to monitor the status of queues in real time, and prebuilt management reports.

“Our new solution based on Microsoft .NET is helping us improve efficiency through planned process automation, support for workflows and work queues, and improved planning and reporting,” says Chumber. “The advanced features of PEPS were easy to build, thanks to the rich functionality provided by the Windows platform.”

Selection of an Integration Framework

At the heart of the PEPS solution is a comprehensive, robust enterprise application integration (EAI) framework. Before building that framework, CTSC hired Xavor, a Microsoft Certified Partner, to help define integration requirements and recommend the best integration solution. Business goals that drove that analysis included the need to:

- Integrate online transaction processing, workflow, and external systems to deliver a full range of tax services.
- Support the integration of applications across the breadth of technologies and platforms that exist within Countrywide.
- Facilitate the reengineering of current processes and workflows by providing support for implementing electronic work distribution and movement, instrumented and repeatable processes, and abstraction of workflow logic from individual applications.
- Allow a phased rollout of new applications by using existing application interfaces as much as possible, and allow new applications to integrate with old ones as the company transitions to a Windows-based infrastructure.

At a technical level, CTSC wanted to eliminate the need for development of custom code so that new applications can communicate with one another. In addition, the company

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wanted an integration architecture in which individual applications do not need to be aware of the complete business processes that they support, nor the mechanisms and protocols for communication with the other applications on which those processes rely.

After a thorough analysis, Xavor recommended that CTSC adopt Microsoft BizTalk® Server 2004 Enterprise Edition, part of Microsoft Windows Server System™ integrated server software, as the cornerstone of its integration strategy. Key features and capabilities of BizTalk Server 2004 that led CTSC to follow that recommendation include:

- Support for a hub-based integration model, which minimizes point-to-point integration and allows Countrywide to integrate any given application with the hub only once.
- A publish/subscribe architecture and host-based deployment model, both of which provide the scalability and performance required to support any potential business growth.
- The ability to modify business rules and processes without changing underlying applications, as driven by changing business conditions or requirements.
- Operational and monitoring capabilities that provide deep visibility into both the status of business processes and the solutions on which those processes rely.
- The ability to help reduce integration complexity and costs through software reuse, prebuilt adapters, and superior developer productivity.
- The ability to combine user interaction with business process automation.

- Adherence to, and support for, industry standards as required to facilitate the company’s desire to move toward a more service-oriented architecture.

“Having already adopted an IT strategy based on Microsoft .NET, the decision to use BizTalk Server 2004 for integration made perfect sense,” says Chumber. “BizTalk Server 2004 is built on the same technologies that we’re using for new application development, which helps reduce complexity and accelerate time-to-market for new solutions. Tax processing has multiple stages, and BizTalk Server lets us connect those stages together in a flexible, loosely coupled manner.”

Benefits

The new Procurement Exception Processing System is the twelfth application that CTSC has developed on the Microsoft .NET Framework. By choosing the Windows platform over the next alternative, the company saved roughly U.S.\$1.7 million in initial hardware and software costs and expects to save about \$500,000 annually based on costs associated with maintaining other solutions, as there are virtually no costs incurred in running programs in the Windows environment. Continuing development is up to 50 percent faster.

The company’s new PEPS solution further extends those benefits by increasing the efficiency and accuracy with which procurement exceptions can be processed. Just as important, it provides a reusable foundation for integration and process automation that Countrywide can use across its entire IT infrastructure. With that foundation in place, the company can focus on transitioning its business applications to Microsoft .NET without worrying if old solutions can connect with new ones, and can reengineer and automate business processes as Countrywide continues its

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migration to a more flexible and cost-effective platform.

Increased Productivity

The PEPS solution helps increase productivity for the company's procurement unit because it provides a more intuitive and streamlined UI than the replaced application. By being easier to use, the solution also accelerates learning for new users. The UI also has built-in validation rules that help prevent data entry errors, and the result has been a 5 percent decrease in error rates. “With our new Windows-based solution, 4 of 56 technicians can be freed to do other jobs, and the remaining technicians are 25 percent more productive,” says Chumber.

When the “automatic resolution” feature has been turned on, it should reduce the number of exceptions that must be processed manually and result in further productivity gains and decreased cycle times. Early testing of this feature, on a full test portfolio, has demonstrated up to 25 percent productivity improvement.

Reduced Cycle Times

The work allocation capabilities and visibility into work queue status provided by the solution help keep procurement exception processing running smoothly and is resulting in improved service levels and faster resolution of exceptions. Built-in workflow tools also help reduce cycle times by allowing technicians to route work to another person when different expertise is required. In turn, that faster turnaround helps decrease the penalties assessed by tax authorities for late payment of property taxes. “The time to resolve an exception has decreased by 25 percent, and, thus, penalties paid (due to late payment) could be significantly reduced,” says Chumber.

Improved Ability to Manage Resources

New capabilities provided by the solution have enhanced the company's ability to allocate and manage resources. Built-in reports that run nightly help management measure productivity at individual, work queue, and organizational levels. Collectively, managers have spent 375 fewer hours year-to-date on work planning, and technicians have saved 990 hours year-to-date.

Superior Flexibility, Reliability, and Manageability

The BizTalk Server Business Rules Engine provides increased flexibility by allowing Countrywide to make changes to the solution's business rules “on the fly,” without having to write, compile, and deploy new code. Further, the solution requires only a single hour of attention each week from a database administrator, who spends that time doing routine database maintenance. Reliability also has been excellent; the solution has experienced no unplanned downtime since it went into production in December 2004.

Rapid Time-to-Market

Largely due to the capabilities provided by BizTalk Server 2004, along with the rich prebuilt functionality in the .NET Framework, and the high level of developer productivity provided by the Microsoft Visual Studio® .NET 2003 development system, CTSC was able to skillfully build and deploy its new solution in only three months—even with the required learning curve. Developers chose to learn and implement only those BizTalk Server features that were needed for the solution, while still preserving the option to use additional capabilities of BizTalk Server in later versions of the solution or in other projects.

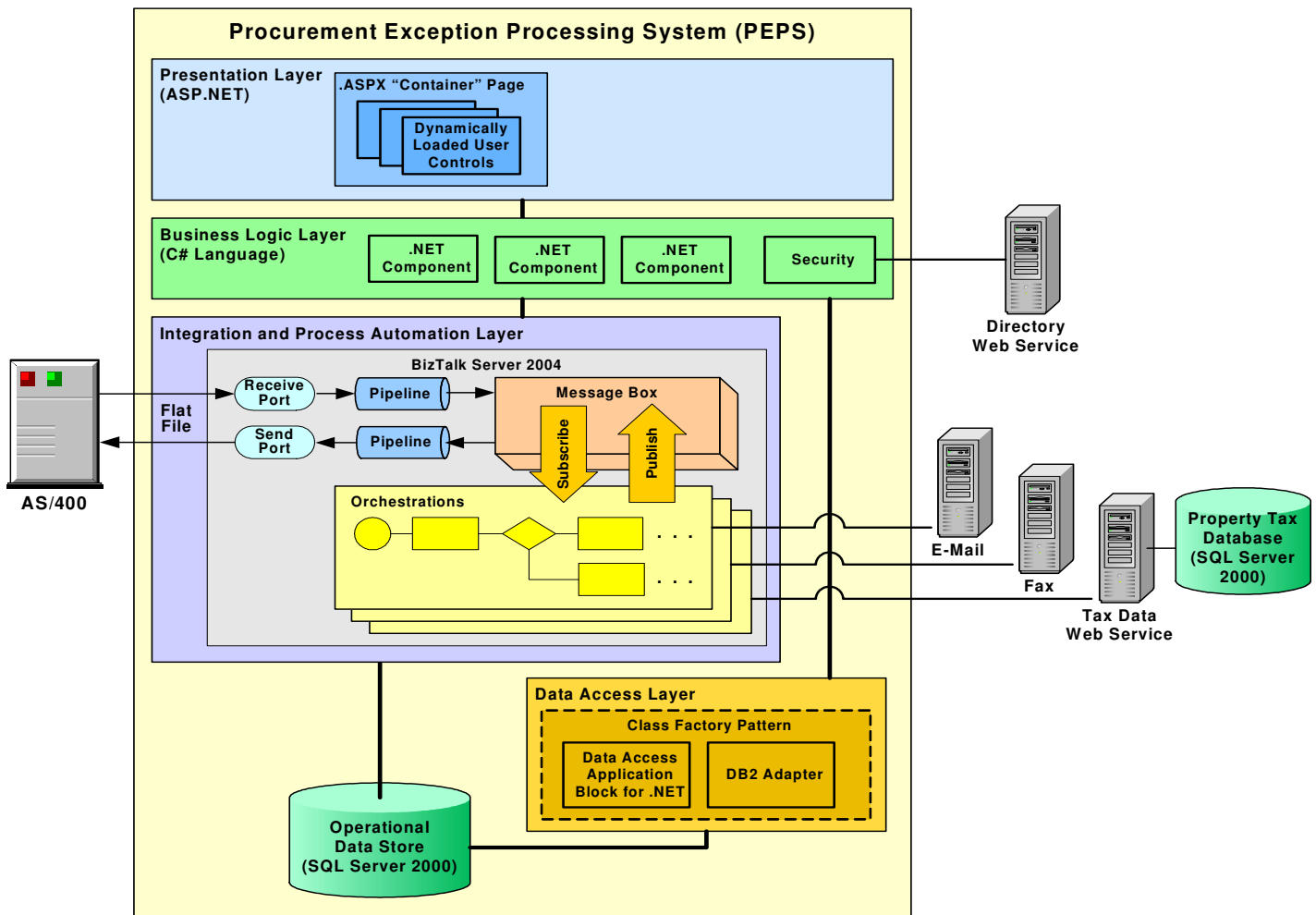
(The remainder of this document describes the technical architecture of the solution and the challenges faced in building it.)

Architecture Synopsis

The software development group for the Procurement Exception Processing System solution consisted of one developer from Xavor and seven from Countrywide Tax Services: one focused on business logic, two worked on the UI and assisted with business logic, two focused on BizTalk Server, and two were part-time database developers. The PEPS solution was developed in only three months—two for code and one for test—and went into production in December 2004.

All solution components run on the Microsoft Windows Server™ 2003 operating system, which is the foundation of Windows Server System integrated server software. Data storage is provided by Microsoft SQL Server™ 2000 Enterprise Edition. All development was done by using the Microsoft Visual Studio .NET 2003 development system and runs on the Microsoft .NET Framework—an integral component of the Windows operating system that provides a programming model and runtime for Web services, Web applications, and smart client applications.

Figure 1. At the heart of the PEPS solution architecture is BizTalk Server 2004, which facilitates business process automation and integration with other systems.



“We’re taking a phased approach to the adoption of BizTalk Server, choosing and learning the features that are applicable to each new scenario.”

Jay Fang, Database Developer, Countrywide Tax Services Corporation

The logical architecture of the solution, which is illustrated in Figure 1, consists of five layers: presentation, business logic, integration and process automation, data access, and database.

Presentation Layer

The presentation layer of the solution runs within the Microsoft ASP.NET environment on Internet Information Services (IIS) 6.0, the built-in Web server in Windows Server 2003. The UI is based on Web Forms—the classes in the .NET Framework for the development of rich Web-based solutions—and was developed by using the Web Forms Designer in Visual Studio. Controls on those Web pages are bound to objects in the business logic layer.

The entire user desktop runs within a single .aspx “container” page, which CTSC developed for a previous solution and now uses across all new Web-based applications. The page contains four sections: header, footer, menus, and content. ASP.NET user controls for the content area are loaded dynamically, as driven through database tables and configuration files. CTSC developers overwrote the post-back behavior for user controls to differentiate that event at a control level from a post-back at a page level—an approach that lets the solution avoid reloading static elements (like combo boxes that are used for specifying a state or county).

“The use of a common container page accelerates solution development and reduces developer training,” says Jay Fang, Database Developer at Countrywide Tax Services and one of the architects of the solution. “It has placeholders for various page elements, and low-level wiring is built-in. Developers know exactly where to put their hooks and can focus on application-specific functionality instead of building all the required plumbing from scratch every time.”

Business Logic and Data Access Layers

The presentation layer of the solution communicates with the business logic layer through the object remoting capabilities of the .NET Framework. All components in the business logic layer are written in the C# programming language and run as managed code, including those components for data access, security, exception handling, and common system services such as caching.

At first, CTSC implemented an authentication mechanism based on database tables that store user names and passwords. Since then, the mechanism has been modified to use the company’s implementation of the Active Directory® directory service, which the mechanism accesses through a Web service interface. Security is enforced at the UI level; the user controls within the main .aspx page rely on entries in database tables to determine and enforce which data and functionality can be accessed for each user role.

CTSC developers now are implementing a common exception logging service for use across all applications. Developers accelerated software development by starting with the Exception Management Application Block for Microsoft .NET—a prebuilt code block provided by Microsoft as part of its Patterns and Practices guidance (located at www.microsoft.com/patterns) are customizing the block to support issues of criticality, such as whether an event should be logged for later inspection or whether it warrants paging someone immediately. The transport mechanism for such events is still undecided.

The solution’s data access layer is a drop-in component that Countrywide reuses across all its .NET applications. Based on the Data Access Application Block for .NET, the layer uses a factory approach that lets developers

access Microsoft SQL Server 2000 or DB2 databases without having to know the details of those databases or differences between database platforms.

Integration and Process Automation Layer

The integration layer of the solution relies heavily on BizTalk Server 2004, which handles integration with several systems including:

- The Countrywide Home Loans AS/400, which runs a DB2 database, from which the PEPS solution receives exceptions to be processed and passes back the required tax bill information.
- An internal system that runs on the Microsoft .NET Framework and SQL Server 2000, which contains property tax information for 80 percent of the properties in the United States.
- External e-mail and fax systems, which are used to send requests for information to some real-estate tax authorities.

BizTalk Server also handles the processing of incoming exceptions; first, attempting to resolve them automatically and, if not successful, sorting them into work queues for processing by procurement technicians and facilitating outgoing communications when required. Here's how the integration and business process orchestration features of BizTalk Server are used to make all that happen:

1. The AS/400 sends a file containing between 3,000 and 6,000 records (each a procurement exception) to a directory on a network share by using File Transfer Protocol (FTP).
2. A BizTalk Server "receive" port configured with a file adapter picks up files from the

network share and processes them in a flat file pipeline. Within the pipeline, a flat file disassembler that ships with BizTalk Server is used to parse the file and convert it to XML. The XML file then is dropped into the BizTalk Server message box.

3. A BizTalk Server orchestration that subscribes to those XML messages picks up the file, checks its field types, and applies data integrity rules. The data within validated records is inserted into the solution's operational data store by using a BizTalk Server Send port, which is configured with a SQL Server adapter that calls stored procedures in the database.
4. Another orchestration monitors the database tables into which new data is inserted and processes them one at a time, using a send port configured with a SOAP adapter to connect with the company's property tax information database. The response from that system flows through a receive port configured with a SOAP adapter, and the data within that response is inserted into the PEPS operational data store.
5. Records that were successfully resolved in the previous step are sent back to the AS/400 by another orchestration that runs at six-minute intervals. The orchestration monitors the PEPS database tables, picks up those records marked as resolved, and packages them as a flat file that is sent to the AS/400 by using FTP.
6. Records that cannot be resolved automatically are picked up by another orchestration, which examines each record and places it into the appropriate work queue (managed by using SQL Server tables) depending on the applicable tax authority.

7. When an e-mail communication is required, information about that communication is placed in a database table. An orchestration periodically scans that table and, if new records are found, invokes an in-process C# assembly that sends an e-mail message. Similarly, a separate orchestration invokes a third-party Component Object Model (COM) component wrapped as a .NET assembly to call the company's fax system.

Except for integration with e-mail and fax systems, BizTalk Server does not play a role in the manual processing of exceptions. Instead, the PEPS UI interacts directly with the database-driven work queues through the business logic and data access layers. Exceptions resolved through manual processing are picked up by the orchestration in step 6 and sent to the AS/400, along with those that were resolved automatically.

While implementing the above-functionality, developers used the Health and Activity Tracking feature of BizTalk Server to monitor and debug orchestrations. The Business Rules Engine in BizTalk Server is used to validate incoming data—an approach that allows changes to those validation rules on the fly, without having to write and deploy new code.

Database

The operational data store for the PEPS solution resides on a shared active/passive SQL Server 2000 database cluster. Rather than designing a new database from scratch, CTSC added new tables to its existing tax service database. That database is approximately 40 gigabytes (GB) in size, with a largest table of 7 million records. The company's property tax information database, which the PEPS solution accesses through a Web service interface, is approximately 200 GB and has a largest table of 120 million records.

Physical Architecture

The presentation and business logic tiers of the solution reside on a pair of HP DL380 server computers that run Windows Server 2003 Enterprise Edition with Internet Information Services 6.0, each server configured with two processors and 2 GB of RAM. Session state is managed in-process, with a hardware load balancer used to implement “sticky” sessions that pin the user to a single server.

The integration and process automation layer resides on a pair of HP DL580 server computers that run Windows Server 2003 Enterprise Edition, BizTalk Server 2004 Enterprise Edition, and SQL Server 2000, Enterprise Edition, each server configured with two processors and 2 GB of RAM. One server handles orchestrations for import, export, and sorting into work queues; and another handles those for data validation, automatic resolution of exceptions, and e-mail and fax communications. All orchestrations are configured on both systems in case Countrywide needs to take one server offline.

The operational data store for the PEPS solution resides on two HP DL740 server computers that run Windows 2000 Advanced Server and SQL Server 2000 Enterprise Edition, each configured with eight processors and 8 GB of RAM. External data storage is provided by an EMC Symmetrix storage area network. In the future, Countrywide plans to migrate the database to the 64-bit editions of Windows Server 2003 and SQL Server 2000 running on Intel Itanium 2–based servers. A separate 32-bit system will be used to run SQL Server Data Transformation Services.

The company's production data center resides near its headquarters in Calabasas, California, with a disaster recovery facility with similarly configured systems in Texas.

Technical Challenges

Although Countrywide Tax Services built its new solution in only three months, developers faced only a few minor design issues and technical challenges along the way. However, because of the flexibility provided by the Windows platform coupled with CTSC's skilled management team, none of the problems proved very difficult to overcome.

Learning Curve

One challenge was the learning curve for a new technology—BizTalk Server—which CTSC developers had not used before. To minimize that curve, they carefully chose which BizTalk Server features were needed for the project, deciding on orchestrations and the Business Rules Engine. In the company's second project using BizTalk Server, a collections workflow solution for which development will start later in 2005, Countrywide plans to expand its use of BizTalk Server to include Business Activity Monitoring (to track the status of running business processes within the system) and possibly Human Workflow Services, which facilitate the combining of process automation with human-to-system interaction.

"The learning curve for BizTalk Server wasn't trivial, but we made up the time because we didn't need to write much code to use it," says Fang. "We're taking a phased approach to the adoption of BizTalk Server, choosing and learning the features that are applicable to each new scenario."

Performance and Scalability

Performance and scalability were key technology selection and design considerations because CTSC plans to use the integration and business process automation framework developed for the PEPS solution to support a suite of future applications. The host-based architecture of BizTalk Server 2004 will support this need

well by allowing the company to scale out a single, logical host across multiple physical servers—a capability that CTSC plans to use on its next project.

Integration with AS/400

Initially, CTSC developers had considered connecting directly with the AS/400 through the data access layer—an existing solution component that had a built-in DB2 adapter. However, upon further analysis, they realized that the use of BizTalk Server for integration would provide greater flexibility. This decision was made in the design phase, and implementation of the flat file pipeline within BizTalk Server took less than five weeks, including the learning curve.

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 - Microsoft Windows 2000 Advanced Server
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 - Microsoft SQL Server 2000
- Microsoft Visual Studio .NET 2003
- Technologies
 - Microsoft Active Directory
 - ASP.NET
 - Microsoft Internet Information Services 6.0

Hardware

- 2 HP DL380 two-processor server computers
- 2 HP DL580 two-processor server computers
- 2 HP DL740 eight-processor server computers

Partners

- Xavor

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