Interactive Forms based on Adobe® software

Executive summary

Today a growing number of users within and beyond the enterprise firewall interact with enterprise applications—such as ERP, CRM, and HR—to facilitate key business processes. Often, these interactions are via paper-based forms, such as purchase orders, travel requisitions, customer orders, and expense reports. But paper-based forms are error-prone, quickly outdated, frequently redundant, and often require manual data entry that leads to inaccurate data. To overcome the drawbacks of paper-based forms, many enterprises have implemented online, or Web-based, forms using HTML. However, HTML forms have several limitations of their own. They are difficult to print, cannot be handled offline, and more often than not, have a different look and feel than paper-based forms, engendering confusion and mistakes.

Given the proliferation of new business processes and the need to integrate an expanding population of users into these processes, Adobe and SAP have partnered to create a solution that allows enterprises to develop interactive forms that are integrated with business processes—quickly and easily. The joint solution, called *Interactive Forms based on Adobe software*, integrates interactive PDF-based forms with business processes that are supported by Web-based SAP applications developed and deployed using SAP's Web Dynpro framework[1].

With Interactive Forms based on Adobe software, users can interact directly with business processes using interactive forms, such as personnel change requests, cost center change requests, internal requisitions, and online recruiting forms. The solution provides a bridge between the highly structured transaction data stored in enterprise applications and the unstructured, document-based information and processes that exist inside and outside the enterprise firewall. With this direct interaction, enterprises can improve communication and collaboration, increase data accuracy, reduce operational costs, and ensure the implementation of best practices.

Solution overview

Through a combination of Adobe and SAP technologies, Interactive Forms based on Adobe software allows enterprises to eliminate redundant and inaccurate data and improve the speed with which they can respond to customer needs and changing business requirements. End users access interactive PDF forms directly from their Web Dynpro application. The forms can be prepopulated with information stored in the SAP application based on the user's role in the business process. End users can then add supplementary information or update existing information directly in the interactive form—online or offline.

After the user enters data into the form, the data can be validated for appropriate format, using client- or server-side validation. Also, calculations—such as current interest rate or overtime premiums—can be made using Web services or direct application programming interface (API) connections with the Web Dynpro application. When the user submits the interactive PDF form back to the SAP application, the data is automatically transferred from the form to the SAP application using XML.

Fully integrated into SAP NetWeaver '04[2], Interactive Forms based on Adobe software enables developers to:

- Design templates and create Interactive Forms in SAP NetWeaver Developer Studio or ABAP Workbench using Adobe LiveCycle™ Designer software

- Integrate Interactive Forms with any SAP application

- Distribute Interactive Forms from within SAP applications to users for a multitude of business processes, including ERP, CRM, and SCM

Interactive Forms based on Adobe software is based on the following technology components from SAP:

- SAP Web Application Server—Includes a Java 2 Platform, Enterprise Edition (J2EE) engine that contains the Web Dynpro run time, including a server-side, interactive form user interface element for executing Web Dynpro applications with Interactive Forms. SAP Web Application Server also contains SAP NetWeaver Developer Studio, an Eclipse based development environment for Java that enables the creation of Web Dynpro applications containing Interactive Forms. Interactive Forms based on Adobe software is integrated with SAP NetWeaver Developer Studio.

- PDF object—An encapsulated object that presents an API for Adobe Document Services calls. This API is offered for both Java and ABAP.

Interactive Forms based on Adobe software includes the following Adobe technology components:

- Adobe LiveCycle Designer—A design-time environment for creating Interactive Forms in an easy-to-use, drag-and-drop manner. Adobe LiveCycle Designer is fully integrated with SAP's two proven development environments: SAP NetWeaver Developer Studio for the development of Java-based SAP applications, and ABAP Workbench for the development of SAP applications using SAP's ABAP language.

- Adobe Document Services—A set of runtime services, deployed on the SAP Web Application Server, that:

  - Convert XML form templates (created using Adobe LiveCycle Designer) to PDF and various print formats

  - Set Adobe Reader® rights to enable users to annotate forms, save them locally, and include digital signatures for authentication using the free and ubiquitous Adobe Reader software

  - Extract data from SAP applications into Interactive Forms and transfer form data back into SAP applications using XML

  - Support certification of form templates to ensure the authenticity and integrity of the form template[3]

  - Enable encryption to ensure the confidentiality and privacy of the form[4]

- Adobe Reader[5]—The universal reader is all that is needed by end users to display Interactive Forms at run time. Forms created using Interactive Forms based on Adobe software are displayed either in a browser using the Adobe Reader plug-in or by the standalone Adobe Reader.

Interactive Forms based on Adobe software is supported on the following server operating systems:
- Microsoft® Windows® 2000 Server/Windows Server 2003
- Sun™ Solaris™
- HP-UX
- IBM® AIX®
- Red Hat® Linux®/Intel®
- SUSE® LINUX/Intel

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[2] Interactive Forms based on Adobe software is available as part of SAP NetWeaver (through SAP Web Application Server 6.40 and mySAP ERP). ABAP-based data in SAP R/3 applications can be accessed from Web Dynpro applications using technologies such as the SAP Java Connector (SAP JCo) and Adaptive RFC.

[3] Available in the next release of SAP NetWeaver.

[4] Available in the next release of SAP NetWeaver.

[5] Requires Adobe Reader 6.0.2 or higher.
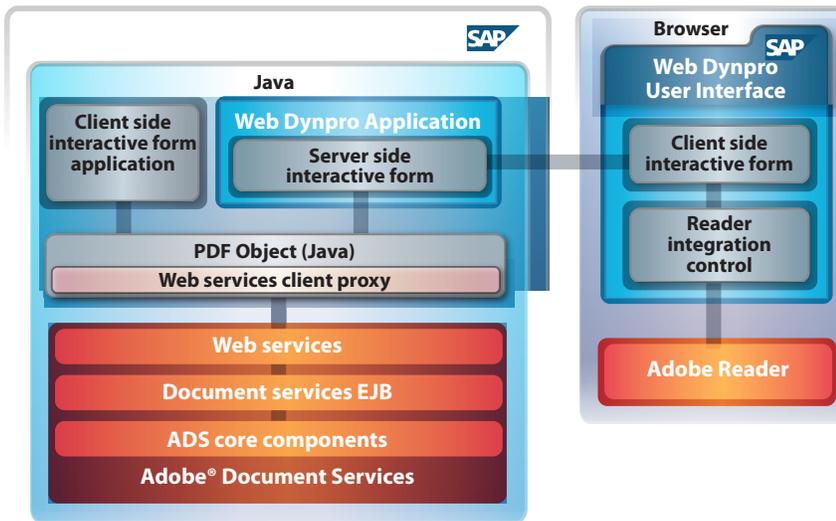
Figure 1.
Interactive Forms Architecture – Run Time

The following sections describe how developers can create Interactive Forms and integrate them with their Web Dynpro applications, using Interactive Forms based on Adobe software.

Designing, creating, and deploying Interactive Forms in Web Dynpro applications

Interactive Forms based on Adobe software allows enterprises to reduce the time required to design, manage, and maintain extended forms-based processes using standards-based, easy-to-use form design and deployment tools. Rather than invest in expensive, time-consuming custom JavaServer Pages development, enterprises can use Adobe LiveCycle Designer—embedded within the SAP NetWeaver Developer Studio development environment—to design and create interactive PDF-based forms that are integrated with Web Dynpro applications. The solution enables developers to create interactive online and offline forms for new business scenarios.

Online forms

In an online form scenario, the user maintains a connection to the SAP application, for example through a company portal. The form is filled out by the user and submitted to the server in the same online session. The form may also include some prefilled information based on the recipient's name, role in the organization, title, and so forth. Here is how an online form scenario functions:

1. Triggered by an end user working in a Web Dynpro application, Adobe Document Services generate an interactive form and populate it with relevant application data.

2. The interactive form is displayed using the Adobe Reader plug-in during execution of the Web Dynpro application in a browser.

3. The Web Dynpro application receives the displayed data or completed PDF document, the Adobe Document Services extract the data from the PDF file, and the application writes the user-entered data to the back-end system.


Assembly line worker

Bill of Material, Material properties, Q-Forms, . . .

SAP Application
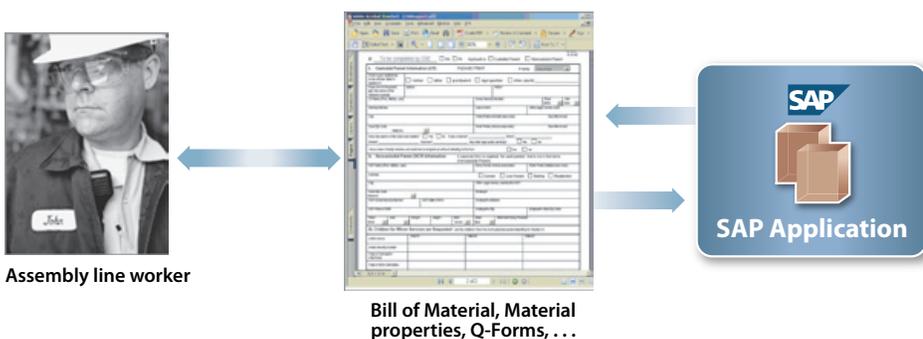
Figure 2.
Online forms example

Offline forms

In an offline form scenario, the user may download and save the interactive PDF form for later data entry and submission. Here is how an offline form scenario using upload/download functions:

1. The user downloads an interactive form to the local hard drive from a Web site.

2. The form is displayed locally using Adobe Reader.

3. The user can make changes to the interactive form using Adobe Reader.

4. The user then uploads the interactive form from the local file system to the Web site.

Support for Sales Force

- Marketing campaign determines that certain data from a customer is missing
- Company wants to obtain the data through a customer visit
- Prefilled PDF-meeting-minutes is sent to sales representatives

Sales Representative

mySAP CRM

- Completing form with the customer
- Print-out for the customer as protocol
- Forwarding form to SAP system

- Automatic processing of next steps (e.g. order posting)

SAP

Figure 3.
Offline forms example

Alternatively, an interactive form can be sent to a user via e-mail from a Java application using the Java Mail API or from an ABAP application using the SAP Business Communication Service (BCS). Upon receipt of the e-mail, the user saves the form attachment to the hard drive and fills it in. Then the user either uploads the form using a Web Dynpro application, as described previously, or submits the form to the application via e-mail using the e-mail submit button included in the form.

Document generation

You can create high-quality, multichannel output (print, fax, e-mail) with Interactive Forms. Because of its superior output capabilities, the Interactive Forms solution can also be used for forms that require no direct interaction with the user. For example, business processes using forms that are entirely prefilled by an application and then distributed to recipients—such as customer fulfillment or payroll reports—can benefit from the easy-to-read paper-like attributes of Interactive Forms.

Here is how document generation functions:

1. Based on the data received via the business logic (ABAP or Java application) and a form template, Adobe Document Services merge the forms and their data (in PDF, PS, PCL, or ZPL formats). The form can then be e-mailed, printed, or faxed to employees, partners, or customers.

2. Outgoing forms can be archived in PDF format for future use.

Using J2EE, developers can e-mail generated forms. Using ABAP, developers can e-mail and fax generated forms with the SAP Business Communication Service (BCS). Forms can also be printed using Spool.
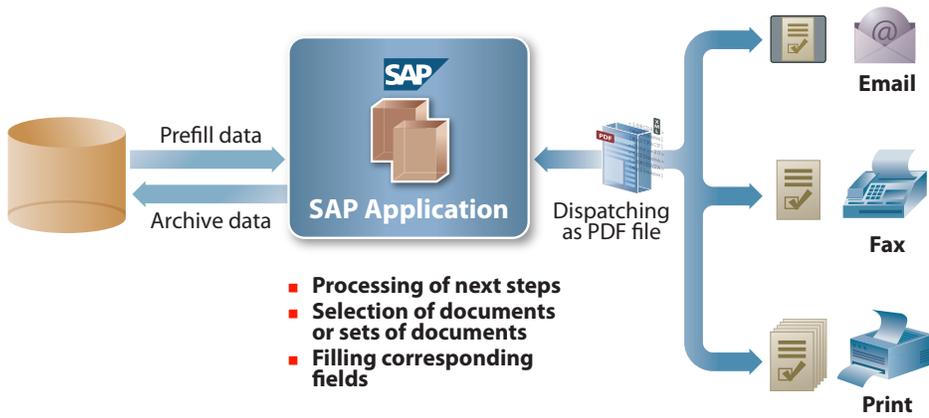
Figure 4.
Document generation example

Creating a simple interactive form using Web Dynpro

This section describes the step-by-step procedures involved in creating a simple interactive form within an SAP Web Dynpro application.
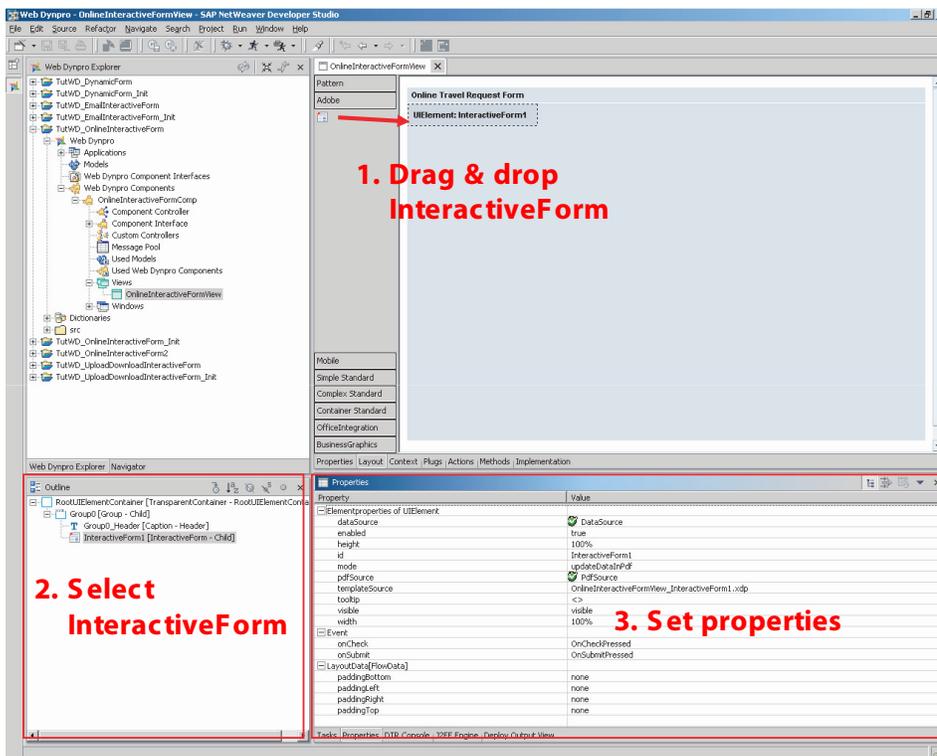

Figure 5.
Defining the form elements

1. Within the SAP NetWeaver Developer Studio Web Dynpro perspective, drag and drop the Interactive Form element onto the Layout pane.

2. Select the Interactive Form element in the Outline pane.

3. Set form properties, such as:

dataSource—Specifies the source of the data to be used in the interactive form and encapsulates the data displayed in the form at run time. The path to the context node providing the data must also be specified. The structure of the context node, which is referenced by the dataSource property, is also displayed in the Data View tab of Adobe LiveCycle Designer. The corresponding context attributes of this node can be bound to Adobe LiveCycle Designer layout elements defined in the form.

updateDataInPdf—Enables automatic entry of a data value. updateDataInPDF is used to update a PDF document with the data provided by the data source or to create a new PDF document from the data source and the form template if no PDF document exists.

pdfSource—Defines the path of the context element that contains the PDF document. This property must be bound to a context attribute of the type binary. This property allows a developer to access the binary file and download it to the local hard disk or read and send the data to a back-end.

templateSource—Specifies the unique name of the form template. The name is automatically generated when the Interactive Form user interface element is inserted into the view.
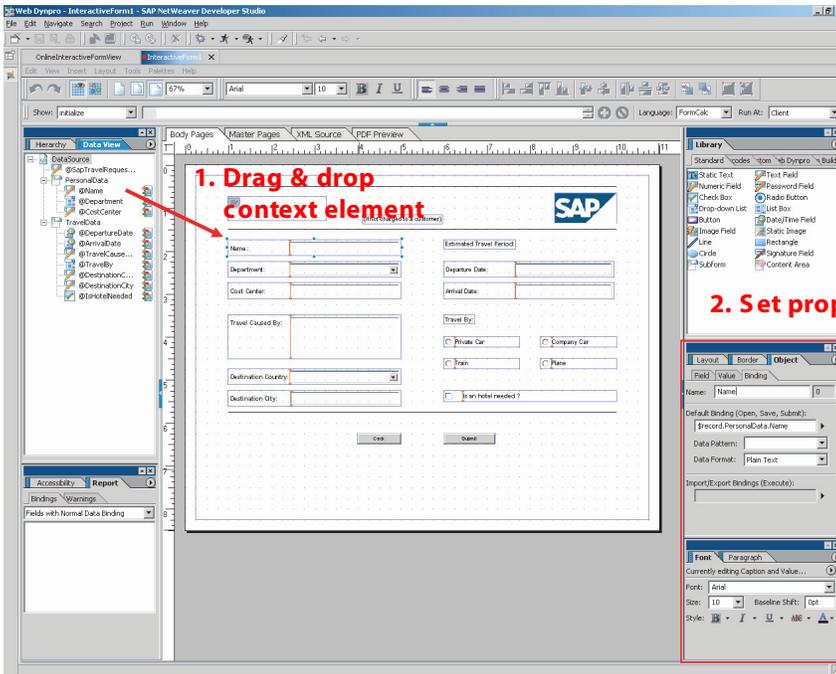

Figure 6.
Form layout and binding to the context

1. Double-click the Interactive Form element to launch Adobe LiveCycle Designer.

2. Drag and drop context elements from the Data View pane to the Body Pages pane in Adobe LiveCycle Designer. A text field representation of Name appears on the Body Pages pane.

3. Set properties, such as marking caption text or defining data patterns, in the Object tab and set fonts in the Font tab.

Note: The binding can be checked and changed in the Object tab. After the first step, Default Binding is set automatically to the corresponding context node $record.PersonalData.Name, but it is also possible to add binding manually.
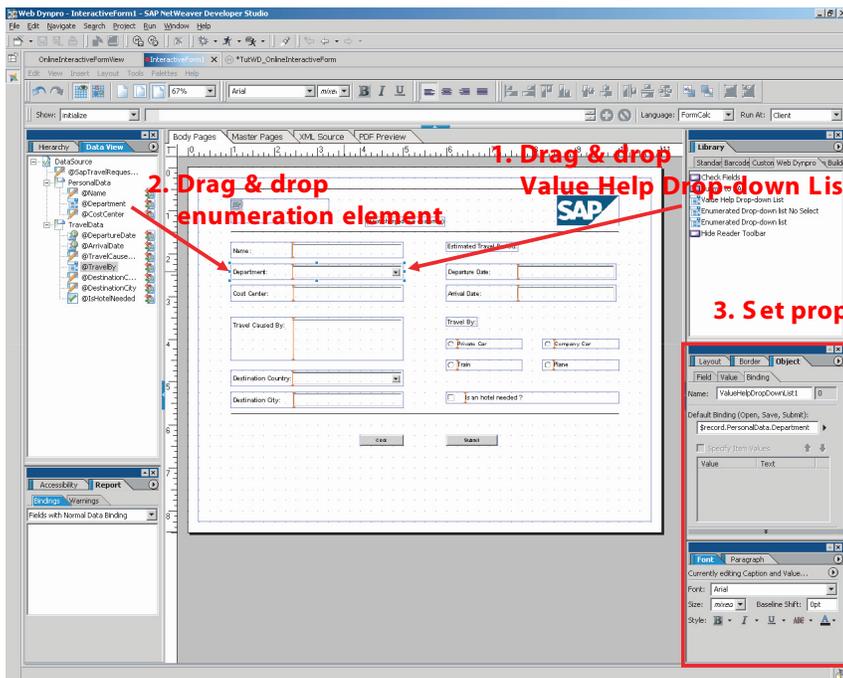
Figure 7.
Integrating drop-down lists

1. Drag and drop a Value Help Drop-down List element from the Web Dynpro Library tab to the Body Pages pane in Adobe LiveCycle Designer.

2. Drag and drop context elements from the Data View tab onto the Value Help Drop-down List element. This action binds the layout element to the corresponding data source.

3. Set the properties of the drop-down list, such as the element caption or fonts.

   Note: SAP NetWeaver provides three different drop-down list elements in the Web Dynpro Library tab:

   Value Help Drop-down List—Used when drop-down list items are not available at form creation. Values enumerated in this type of list are not stored in the form. Item lists can be added dynamically by data type modification.

   Enumerated Drop-down List—Used when drop-down list items are available at form creation. Values enumerated in this type of list are stored in the form. The first list item is selected by default when the form is deployed.

   Enumerated Drop-down List (No Select)—Also used when drop-down list items are available at form creation, but no list item is selected by default when the form is deployed.
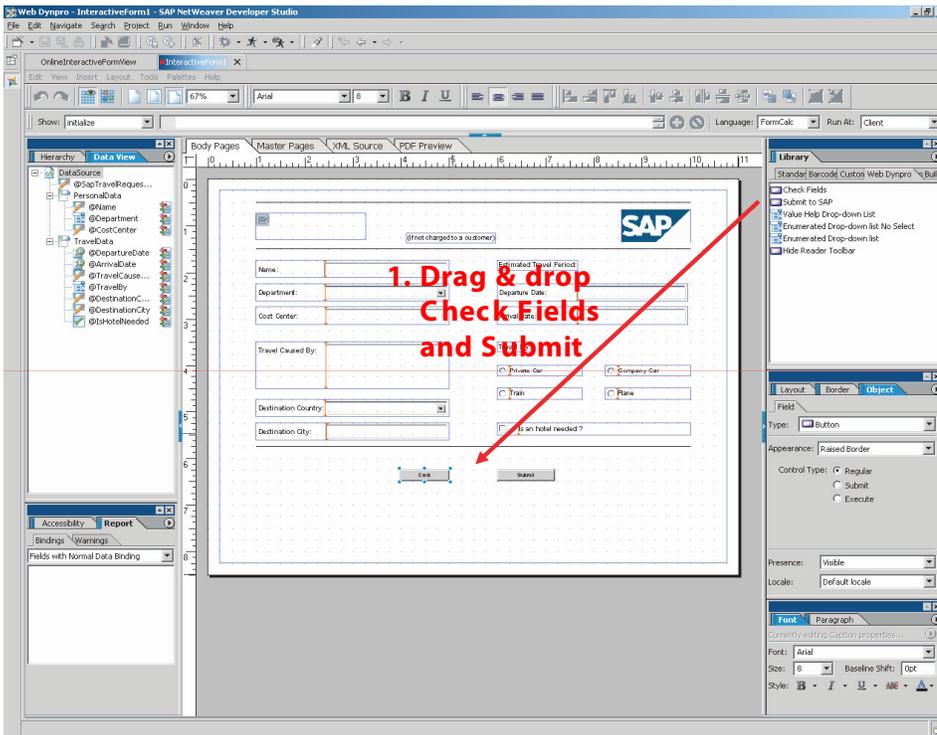
Figure 8.
Integrating Check and Submit buttons—step 1

1. Drag and drop the Check Fields and the Submit to SAP elements from the Web Dynpro Library tab to the Body Pages pane in Adobe LiveCycle Designer.
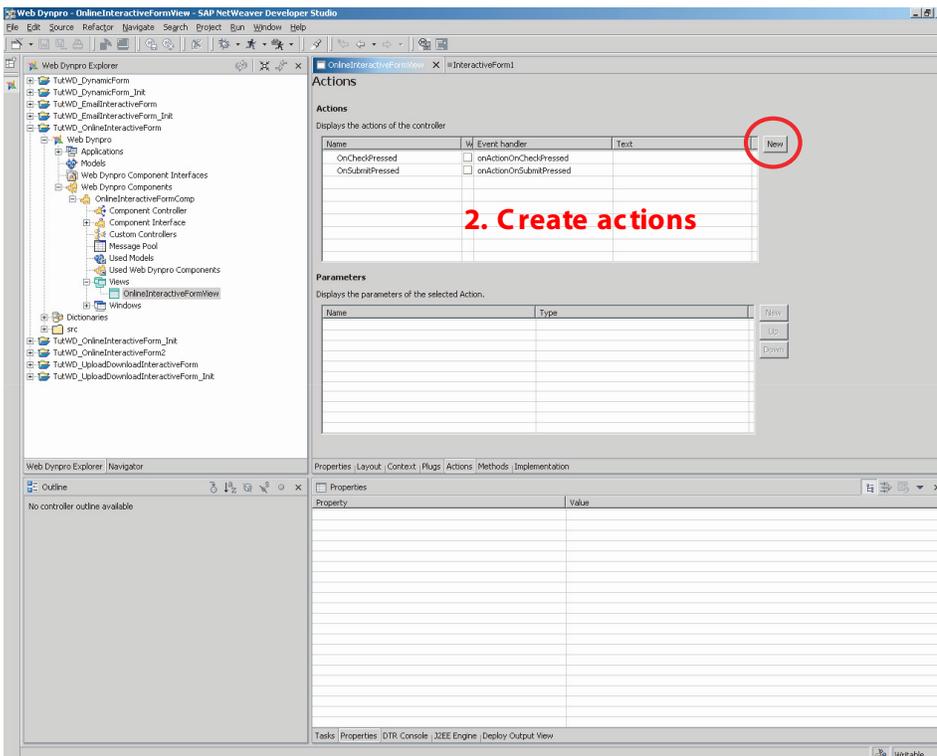

Figure 9.
Integrating Check and Submit buttons—step 2

2. Switch to the corresponding Web Dynpro view and create two new actions named *CheckPressed* and *SubmitPressed* on the Action tab. The corresponding event handlers onActionCheckPressed and onActionSubmitPressed are generated.
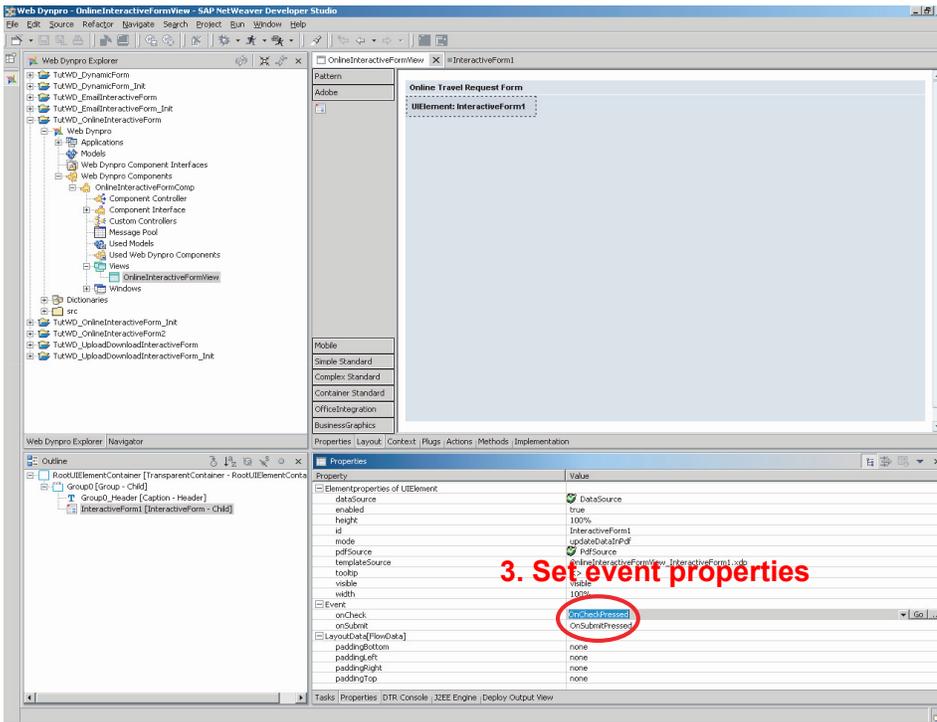
Figure 10.
Integrating Check and Submit buttons—step 3

3. Click the Layout tab, select the Interactive Form element in the Outline pane, and switch to the Properties tab. Select the CheckPressed action for the onCheck event and the SubmitPressed action for the onSubmit event.
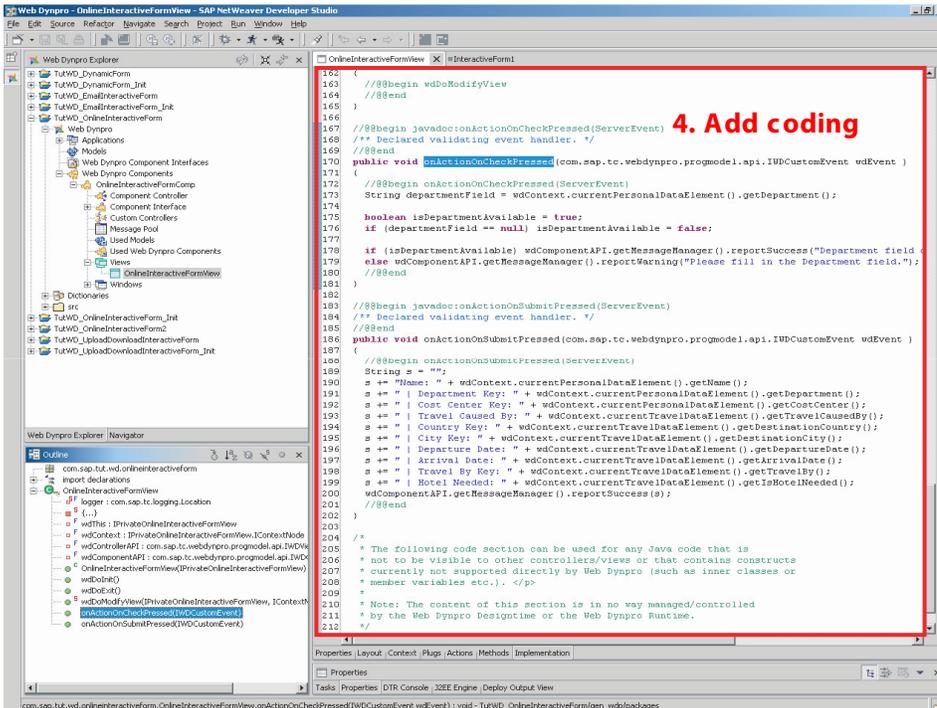
Figure 11.
Integrating Check and Submit buttons—step 4

4. Add the Java code in the corresponding event handlers. You can implement code for server-side checking of the data in the form (CheckPressed) or server-side processing of the data (SubmitPressed).

The Web Dynpro application, including the interactive form, can now be deployed.

Internet Service Request (ISR) and guided procedures

To help SAP application experts create Interactive Forms within SAP applications, mySAP ERP includes an ABAP-based framework called *Internet Service Request*, or *ISR*. The framework guides form designers in creating a consistent look and feel for all Interactive Forms by blending form management, business logic, and workflow management in a consistent, logical manner. Using Interactive Forms based on Adobe software with ISR, you can include Interactive Forms in Java-based Web Dynpro, while the business workflow and related events run in the ABAP stack.

Another new Java-based SAP workflow tool that allows you to use Interactive Forms for data capture and exchange is called *Guided Procedures*. Guided Procedures enables users to create forms using Adobe LiveCycle Designer and to design the form workflow using a browser-based workflow configuration interface. Both Java and ABAP back-ends can be used, and both online and offline forms scenarios are supported.

The following section presents three deployment scenarios that illustrate how Interactive Forms can be integrated with business processes.

Interactive Forms deployment scenarios

Enterprise resource planning (ERP) scenario

A supervisor on the shop floor of a large manufacturer needs to order additional parts and materials so that the company can meet an unexpectedly large customer order. Traditionally, the supervisor would find the appropriate paper-based purchase requisition form, fill it in by hand, sign it, and send it to the next level of management for approval and fulfillment by in-house mail.

Using Interactive Forms based on Adobe software, the same supervisor—already logged in to the SAP NetWeaver Portal through mySAP ERP—accesses the required purchase requisition form on the company portal and displays it in PDF format in his Web browser. Upon display, the form is prefilled with the supervisor's relevant information, such as name, location, and cost center, based on user login.

While remaining logged in to the SAP NetWeaver Portal, the supervisor then enters the required information on the purchase requisition form. When finished, he submits the form back to the system by clicking the submit button in the form. The data is saved to the application database, and the corresponding workflow moves the process to the next step.

- Exchange data with people and systems via real-time information capture in form-based processes
- Create powerful XML-based forms without leaving the integrated SAP environment
- Offer online and offline access—anytime, anywhere—with ubiquitous Adobe Reader client software
- Enable users to participate in form-based business processes that are intuitive
- Create forms that maintain visual integrity and fidelity
- Maintain process familiarity to help promote high user adoption
- Share information with greater control over form security inside and outside the firewall
- Comply with regulatory requirements related to forms and form-based processes
- Build interactive electronic forms
- Reduce form design, development, and maintenance costs with Adobe LiveCycle Designer seamlessly integrated in ABAP Workbench and SAP NetWeaver Developer Studio
- Create sophisticated forms with a point-and-click visual design tool
- Support Web Dynpro, so developers can include interactive PDF forms in intuitive Web applications
- Allow nontechnical users to easily create forms, reducing the need for custom programming skills
- Provide universal access to forms
- Reduce IT complexity and costs with Adobe Reader for client-side viewing and filling of forms
- Enable users inside and outside the firewall to complete forms online and offline, and participate in key business processes without buying additional software
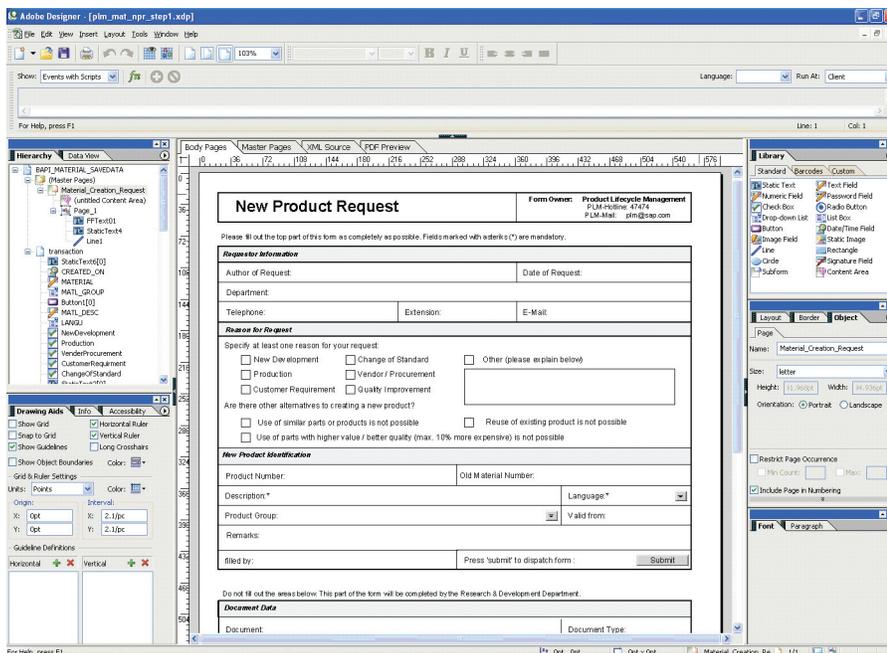
Figure 12.
New Product Request form

Customer relationship management (CRM) scenario

A company running a marketing campaign from its mySAP CRM system realizes that certain data from an important customer is missing. The company sends a sales representative on a customer visit to obtain the data. Triggered by the mySAP CRM system, the existing relevant customer data is prefilled in the corresponding form, which also contains fields for entering the missing data. The form is automatically e-mailed to the responsible sales representative before his scheduled customer visit. He saves it to the hard drive on his laptop for later use.

Upon arriving at the customer site, the salesperson and the customer work together to complete the form. While still at the customer's location, the salesperson prints out the completed form for the customer's records using the print capabilities of Adobe Reader. Then, the sales representative forwards the completed form to mySAP CRM, either by using the e-mail submit button or by uploading the form to the corresponding site in the internal company portal upon his return to the office.

mySAP CRM receives the data entered by the sales rep, processes it, and automatically triggers the next step in the business process.

Figure 13.
Sales Report form

Human resources management scenario

An employee wants to fill out a travel request form for an upcoming customer visit. Using Interactive Forms based on Adobe software, the employee logs into the internal company portal, accesses the travel request form, and opens it in her browser using the Adobe Reader plug-in. The employee can either complete the form online or offline. If she is working online, while connected to mySAP ERP, she fills in the form, which has been prepopulated with specific travel guidelines based on the employee's role and location. The employee then submits the form to the SAP system for approval or routing to the next step in the business process.

Alternatively, if the employee chooses to complete the form offline, she saves the form to her hard drive, fills in the form at a later time, and either submits the form to the SAP system or e-mails the form to continue to the next step in the business process.

Figure 14.
Travel Request form

Conclusion

Interactive Forms based on Adobe software allows developers to create interactive forms that are integrated with business processes. Developers can design, implement, and distribute—and users can access and manipulate—Interactive Forms from within or outside of SAP applications. Acting as a bridge between highly structured transaction data stored in SAP applications, such as mySAP ERP and mySAP CRM, and unstructured form-based information and processes, Interactive Forms based on Adobe software enables enterprises to improve data accuracy, eliminate redundant data and forms, and reduce operational costs. Deploying Interactive Forms based on Adobe software ultimately improves the speed with which they can respond to changing customer needs and business objectives.