Integrate Web Dynpro into your SAP NetWeaver Portal to create dynamic, flexible applications

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Web Dynpro for Java has been popular since its recent introduction as a Java-based user interface (UI) technology. You can use it to quickly develop dynamic, Web-based business applications that run in a Web browser or in any other of the Web Dynpro clients. SAP NetWeaver Portal unifies data and applications, presenting a single view of diverse information in a flexible, secure environment. Clearly, the two technologies work well together.

At first glance, you might want to integrate Web Dynpro applications into SAP NetWeaver Portal by simply writing the application and then using the portal tools to create an iView. This approach, however, does not result in the kind of state-of-the-art, professional portal application your users expect. Your Web Dynpro application runs separately from the portal, with the portal only displaying screens in an iView container.

Instead, integrating Web Dynpro applications into SAP NetWeaver Portal provides the best of both technologies' appealing, secure, and dynamic applications that you can quickly customize. How can you integrate these technologies to take advantage of their strengths without limiting the flexibility and power of the applications?

In this article, I explore SAP's answer to this question, tracing the progress from integrating Web Dynpro applications with the SAP NetWeaver '04 and SAP NetWeaver 7.0 releases to the current version, SAP NetWeaver Composition Environment (SAP NetWeaver CE) 7.1. Using a sample application named StarSearch to illustrate the potential of integrated applications, the article outlines how Web Dynpro and SAP NetWeaver Portal can work together seamlessly. It also explains why tight coupling — a quality that developers generally avoid when designing software — solves the problems of integrated applications.

If you are interested in developing Web applications for business, this article examines how to create sophisticated portal applications using Web

Dynpro for Java.[1] It also explores advanced topics, such as navigating from one application to another, passing data among portal applications, and personalizing your application using the rich set of services available in SAP NetWeaver Portal. Each of these techniques is an important tool to add to your development toolbox for building integrated portal applications. Finally, the article concludes with a sneak peek at the upcoming SAP NetWeaver Business Client and its relationship to SAP NetWeaver Portal.

Note!

This article focuses on Web Dynpro for Java, not Web Dynpro for ABAP. It therefore uses Web Dynpro as the shortened name of the product. The article is not intended as a complete technical reference for the APIs related to integration. For more information on Web Dynpro for ABAP or integration APIs, refer to the resources available at http://help.sap.com and https://www.sdn.sap.com/irj/sdn.

All of the screenshots are based on SAP NetWeaver CE 7.1 unless otherwise noted.

The StarSearch application

StarSearch, a sample Web Dynpro application built on SAP NetWeaver CE 7.1, helps users find and store information about musicians, bands, and music genres, including biographies, discographies, and images. It allows you to search for related Web pages, such as an artist's home page, and then add links to these Web pages for easy access within the application. StarSearch was designed to be a counterpart to a tool like iTunes. In this way, StarSearch lets you listen to your music while learning more about the musicians. Following the Web 2.0 paradigm, you define the content StarSearch displays. Over time, you can collect all the information that you want about your favorite musicians and share your data with other music fans.

Figure 1 shows the main parts of the StarSearch window, which includes various panes of information. In the Selection pane, you can select a musician. The available details are shown on the right side, including the biography of the musician, photos and other images, links to interesting information (which you can add), and a discography. In the Web Search pane on the left, there are links that resulted from a search (a Google search in this case).

StarSearch has the potential to combine the flexibility of a Web application with the power of a database. It is more dynamic than a standard database application because it provides direct access to Web data. It is also more integrated than a Web application because it stores data from various sources and presents related information in a single window. The value of StarSearch comes from its architecture — it was built with Web Dynpro and is delivered on the SAP NetWeaver Portal platform.

How Web Dynpro and SAP NetWeaver Portal work together

To understand how these technologies work together, you need to first understand how they are different. Web Dynpro is a technology for developing state-of-the-art, Web-based business applications, while SAP NetWeaver Portal is a platform for securely delivering these applications to users. SAP NetWeaver Portal can also deliver content to users according to their roles, meaning that an administrator has the option to customize the application, for example, but an employee can only find and retrieve information.

[1] For information on Web Dynpro, see "Web Dynpro — what it is, what it does, why it exists, and how to get the best results from it: An introduction to the fundamental principles of Web Dynpro," by Chris Whealy (*SAP Professional Journal*, January/February 2007).

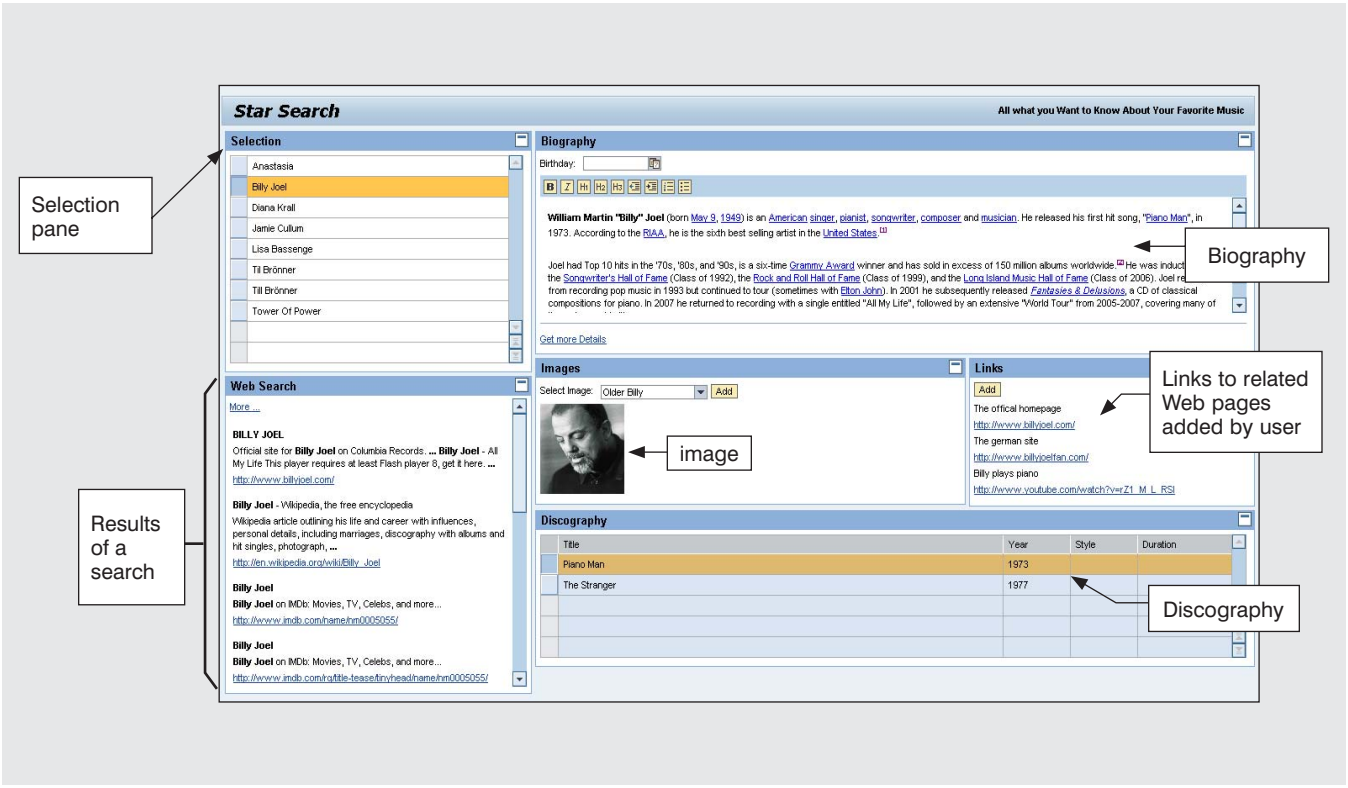

Figure 1 StarSearch sample application

Although SAP NetWeaver Portal and Web Dynpro are sometimes called SAP's UI technologies, each plays a separate role in integrating and presenting content. SAP NetWeaver Portal is designed to be a role-based delivery mechanism for completed applications. You can develop these applications using a technology such as Web Dynpro for Java or Web Dynpro for ABAP, Business Server Pages (BSP), HTML Business (HTMLB) for Java, Internet Transaction Server (ITS), or other non-SAP technologies. The specific differences between Web Dynpro and SAP NetWeaver Portal are detailed in the snapshots that follow. Let's begin this overview with Web Dynpro, as shown in **Figure 2** on the next page.

Snapshot of Web Dynpro

- **Web Dynpro programming model:** Web Dynpro comes in two versions: Web Dynpro for Java, which is developed using an Eclipse-based development environment (called SAP NetWeaver Developer Studio,) and Web Dynpro for ABAP, which is developed in the ABAP Workbench (the standard development environment for ABAP developers). Both versoins follow the same programming model.
- **Web Dynpro components:** Web Dynpro components and Web Dynpro component interfaces provide powerful mechanisms with which to build reusable entities. Instead of creating an application from scratch, you can combine existing Web Dynpro components that provide generic features and application-specific controls. Along with the SAP NetWeaver Development Infrastructure (NWDI), Web Dynpro supports teamwork and projects running in different locations.

  This programming model allows the tight coupling of components, including tools to share data and to allow server-side events among components.

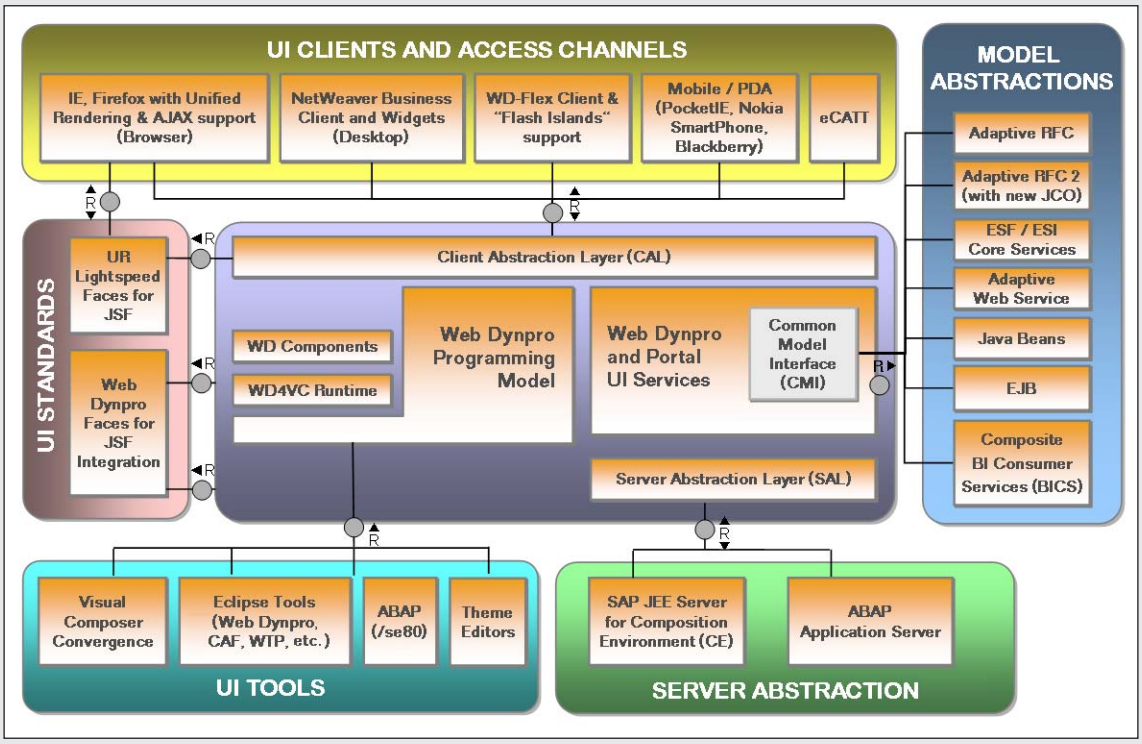

Figure 2 Web Dynpro overview

- **UI clients and access channels:** Web Dynpro provides a rich set of UI controls for building client-independent applications. Based on this Web Dynpro client abstraction, you can easily run your application on different client technologies with-out changing any application logic. The range of available clients and access channels covers both browser-based and rich-client technologies and the capability to run a Web Dynpro application on a mobile device and a state-of-the-art widget.

- **Model abstractions:** Web Dynpro offers a rich set of model implementations, which allows an application to connect to SAP back-end systems, using Adaptive Remote Function Call (RFC), or to non-SAP back-end systems, using the Adaptive Web Service (WS) model or the Enterprise JavaBean (EJB) 3.0 model. StarSearch can use EJB 3.0 to populate data into a database. Using this Web Dynpro model abstraction, you can access all of your models in the same way within your Web Dynpro application.

- **Server abstraction:** The Web Dynpro server abstraction ensures that the Web Dynpro runtime environment can be executed in different server environments, including the SAP J2EE Engine and SAP NetWeaver Mobile.

- **UI standards:** Although Web Dynpro is an SAP proprietary UI technology, Web Dynpro provides the capability to embed UIs based on typical UI standards, such as the Java Server Faces (JSF) technology.

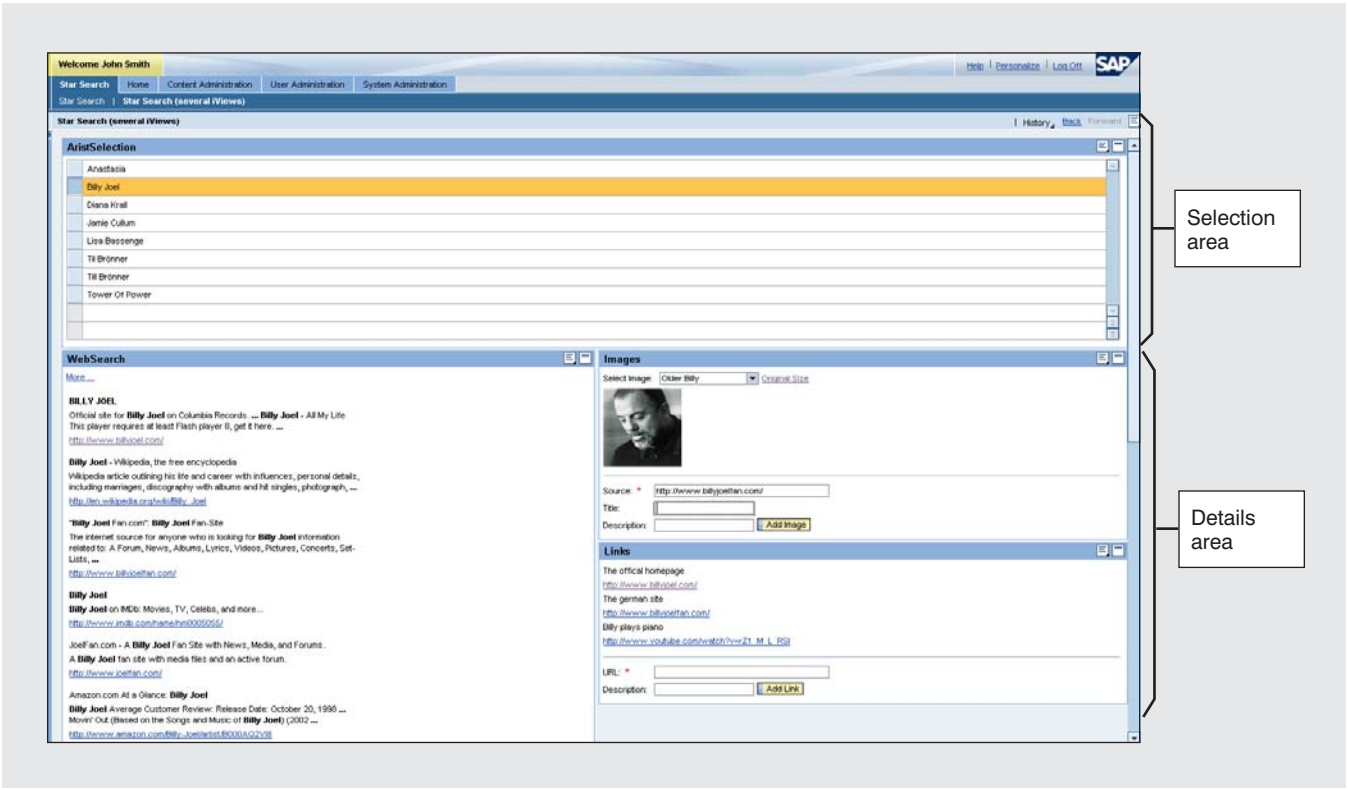

Figure 3 StarSearch application running within SAP NetWeaver Portal

Snapshot of SAP NetWeaver Portal

- **Single entry point:** SAP NetWeaver Portal is the single entry point to several SAP applications.
- **Role-based structure:** All available portal content (i.e., all of the content from applications launched within the portal) is provided to users according to their specified roles so that each user can easily access the applications needed for specific tasks. For example, the portal can distinguish between a manager and an employee. While employees should be able to maintain their personal data, such as their home address and private phone numbers, they are not allowed to change salary data. Managers, on the other hand, need access to employee data, though they should not be able to change it. Using the role-based access to an application, you can provide the appropriate permissions based on the current role of the user.
- **Integration hub:** SAP NetWeaver Portal acts as an integration hub to coordinate SAP and non-SAP applications. The integration starts with the seamless and consistent display of different applications on screen, extends to single sign-on (SSO) mechanisms for all applications, and ends with complete system landscapes that are based on the SAP Federated Portal Network (FPN).
- **Customization features:** SAP NetWeaver Portal provides powerful customization capabilities for single users and for groups of users.

Creating Web Dynpro portal content

Now that you've examined how Web Dynpro and SAP NetWeaver Portal work together, you can focus on how to design and implement an application such as StarSearch. **Figure 3** shows StarSearch running within SAP NetWeaver Portal.

The StarSearch application is split into two main parts: the selection and details areas. In the selection area, you select an artist or a band. In the details area, you can then check for more information about the artist or band, change data (e.g., add comments, notes, etc.), add related pictures and links, or search the Web for more information.

Designing the application layer

Splitting the StarSearch application into a selection area and a details area means that it is designed as a typical "master-detail" application. To create such an application, the UI framework, or application layer, should provide at least the following features:

- **Composition:** To create a consistent interface and save design time, follow a strong composition model that allows you to define reusable units. Depending on the technology you use, these units are called components, composites, or controls. You can combine these single units into larger units.

- **Data sharing:** To combine units to build an integrated application, you must provide data-sharing mechanisms. Sharing data among composed units reduces the session size and avoids redundant back-end calls to retrieve data.

- **Communication channels:** Similar to data sharing, you need to provide flexible communication channels among composed units. The master-detail design of the StarSearch application means it needs at least an event mechanism. When you select an artist, an event is triggered so that the Selection component communicates with other components that show additional data about the artist.

- **Navigation:** To make sure users can navigate from one screen to another, you need to define all possible navigation flows among the composed units.

- **Access to back-end systems:** The application must maintain persistent and flexible access to SAP back-end systems so it can provide up-to-date information.

All of these requirements are fulfilled using Web Dynpro as the application layer.

Designing the portal layer

Besides designing an application layer as the underlying UI framework, you also need to provide ways to customize an application for a single user and a group of users. Personalization can range from hiding UI elements, such as single buttons or complete toolbars, to changing the layout and data fields.

In addition, you often have to combine an application with other content, which might be provided by a different technology. Since the Web 2.0 wave, such a "mashup[2]" is mandatory for a flexible and open environment.

For example, the StarSearch application needs to be flexible enough to serve users in the following scenarios:

- A user wants to personalize the data that StarSearch displays for a selected artist by changing the list of shown components.

- A user wants to combine the StarSearch application with a non-SAP application to buy music CDs. This combination should consist of more than just organizing applications together on one screen by using isolated iFrames, for example. The non-SAP application also should be informed as soon as the user selects a musician.

- A user wants to define default values of several input fields and set the columns included in the tables of information. For example, you could add a Rating field for the Discography pane, and set its default value to five stars.

[2] A mashup is a Web application that combines data from more than one source into a single integrated tool (www.webopedia.com).

To achieve the flexibility to personalize, combine, and publish available applications, you work in the portal layer. Integrating Web Dynpro and SAP NetWeaver Portal in general means seamlessly integrating an application layer and a portal layer.

Loose coupling in SAP NetWeaver ’04

With the SAP NetWeaver ’04 release, SAP introduced a loosely coupled integration approach between Web Dynpro and SAP NetWeaver Portal by running a Web Dynpro application inside an iFrame.

Using loose coupling, a Web Dynpro application is executed as a single Web Dynpro iView. SAP NetWeaver Portal does not know anything about this Web Dynpro application besides a URL calling the application on a certain SAP NetWeaver installation. This type of Web Dynpro iView can be called an NW04 Web Dynpro iView.

This loose integration approach creates no dependencies between a Web Dynpro application and SAP NetWeaver Portal, which contributes to the flexibility of the application. However, using an iFrame allows only client-side integration based on specific functionality. For example, the application might use events to open a basic communication channel between Web Dynpro content and other portal content.

In an NW04 Web Dynpro iView, the boundary between Web Dynpro and SAP NetWeaver Portal (or more generically between the application layer and the portal layer) is obvious and strict. The main consequence for the developer is that it is very difficult to include features from the application layer and the portal layer in a useful combination.

Using tight coupling to integrate Web Dynpro components solves this problem and offers several advantages, such as allowing the components to share data easily. The Web Dynpro application can also use server-side technologies, including events and back-end resources. This saves time because most of the back-end data is loaded only once for the whole application. These benefits are enough motivation to implement the StarSearch application as a composition of several Web Dynpro components that run as one Web Dynpro application.

In contrast, using loose coupling separates the application layer from the portal layer. The application is executed as one iView within SAP NetWeaver Portal, which means the user cannot use the standard portal capabilities to personalize data by adding or hiding specific iViews, for example.

Figure 4 (on the next page) shows the effect of running the StarSearch application as a single iView that has separate application and portal layers.

Although parts of the application look like separate iViews, the entire screen runs as one iView. The Selection or Web Search parts, for example, are not visible within SAP NetWeaver Portal as single entities. Therefore, you cannot change the layout or content of this screen using SAP NetWeaver Portal capabilities, such as by using page personalization tools to change the layout and the content of a page.

To use the standard portal page personalization tools within StarSearch, you must split the entire application into several applications that are executed one by one as separate iViews. This prevents needing to use tightly coupled components within one Web Dynpro application. In addition, the only communication mechanism that a set of isolated and loosely coupled iViews can use is client-side events. Ultimately, the StarSearch functionality requires several Web Dynpro applications. This dramatically increases the amount of necessary server resources because more application instances are needed and these instances have no way to share data. You might need to reload the same data from a back-end server in each application.

An NW04 Web Dynpro iView has the following restrictions:

- You can embed them only as isolated iViews. If you include more than one of them on the

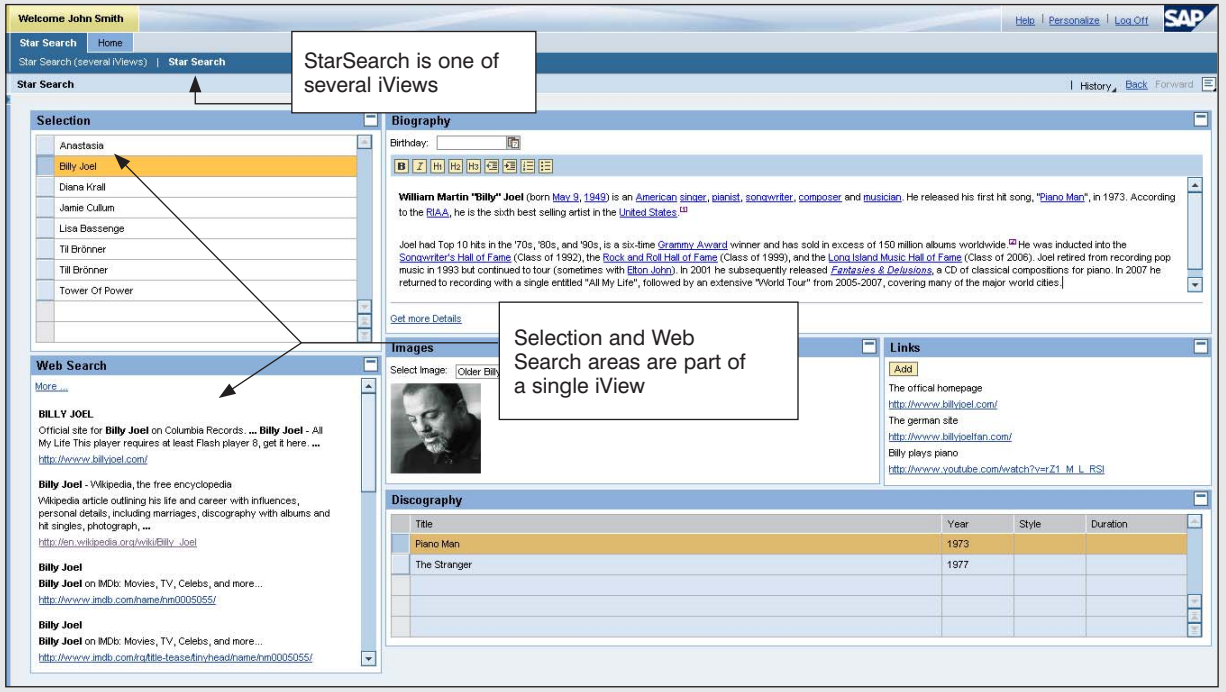

Figure 4 StarSearch running as an NW04 Web Dynpro iView

same page, you may run into performance problems.

- The portal does not know about the internal structure of the Web Dynpro application.
- When you create Web Dynpro portal content, you cannot access the available Web Dynpro applications. For example, you must enter values, such as the namespace and the application name, directly into the editor instead of selecting them from a list (see **Figure 5**).
- An NW04 Web Dynpro iView and the portal communicate through client-side mechanisms. Even if both the Web Dynpro application and the portal are running on the same SAP J2EE Engine, no server-side communication channel is available, and sharing a large amount of data, for example, is not possible.

Typically, an SAP NetWeaver ’04 application cannot overcome the boundary between the application layer (Web Dynpro) and the portal layer (SAP NetWeaver Portal).

Web Dynpro Page Builder in SAP NetWeaver 7.0

To resolve the integration problems of SAP NetWeaver ’04, SAP NetWeaver 7.0 introduced the Web Dynpro Page Builder. From a technical point of view, the Web Dynpro Page Builder is a standard Web Dynpro application that allows the user to perform the following two tasks:

- **Launch a Web Dynpro application:** The Web Dynpro Page Builder launches a Web Dynpro application as an embedded Web

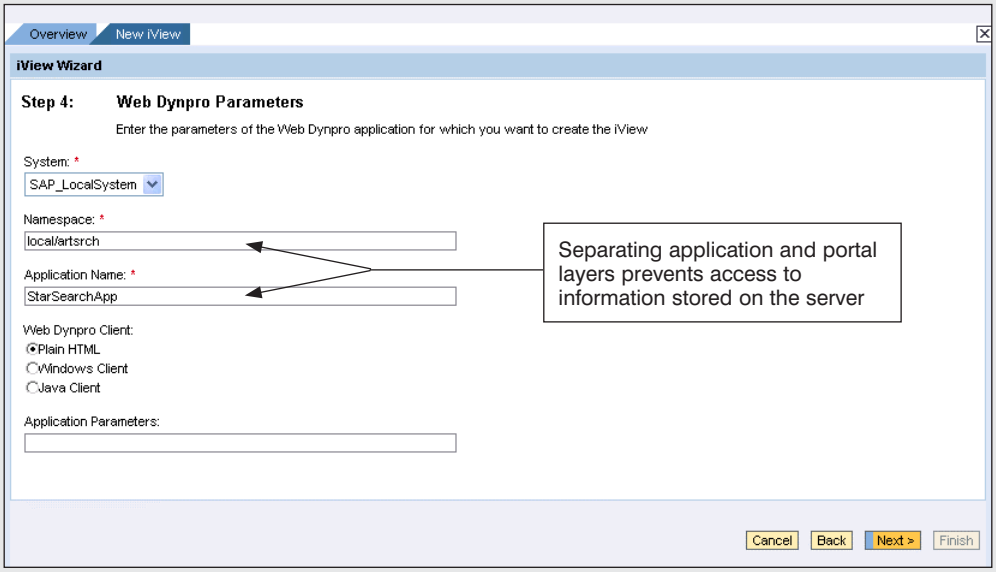

Figure 5 Creating a Web Dynpro NW04 iView

Dynpro iView, which can be called an NW70 Web Dynpro iView. To run a Web Dynpro application, the Web Dynpro Page Builder provides the portal environment, which defines the theme or other settings that the Web Dynpro application uses. Using the portal service factory, which is part of this environment, the launched Web Dynpro application can access a set of portal services.

Besides providing the portal environment, the Web Dynpro Page Builder also controls the lifetime of Web Dynpro applications running as embedded iViews.

- **Run a Web Dynpro page:** The Web Dynpro Page Builder creates, runs, and lays out a portal page depending on the page definition stored in the Portal Content Directory (PCD). These pages can be called Web Dynpro pages.

To provide better integration when you create the Web Dynpro portal content, an NW70 Web Dynpro iView allows Java Naming and Directory Interface (JNDI) based access to the deployed Web Dynpro applications. This means you can access necessary values as you create Web Dynpro portal content.

Figure 6 on the next page shows the Web Dynpro iView Wizard, which allows you to create an NW70 Web Dynpro iView. The Web Dynpro JNDI layer provides the list of deployed Web Dynpro applications so that you do not have to enter the application names directly, but can select one from the list.

Running split Web Dynpro applications

Based on the Web Dynpro Page Builder, you can display more than one iView in a single Web Dynpro application. Doing so overcomes most of the limitations of NW04 Web Dynpro applications.

Figure 7 (on page 49) shows the StarSearch application running as a split application by displaying a set of iViews. Instead of showing the whole application as one iView, each part is displayed separately.

Because the Selection and Web Search panes are

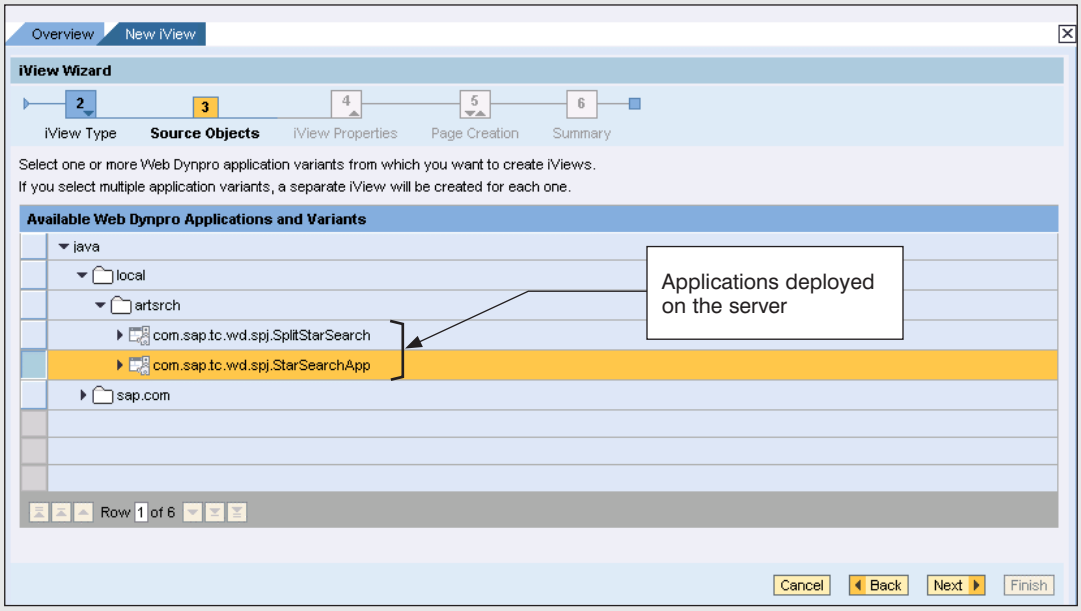

Figure 6 Creating an NW70 Web Dynpro iView using the Web Dynpro iView Wizard

running as different iViews, you can customize each page by adding or removing iViews, which can show Web Dynpro content or other content as necessary. Although the whole application is now displayed in SAP NetWeaver Portal as a set of iViews, all the iViews are running within *one* Web Dynpro application instance. Therefore, you do not need to use client-side events to communicate among the iViews. Instead, you can use the standard Web Dynpro mechanisms for data-sharing and server-side events.

Application pages in SAP NetWeaver CE 7.1

In SAP NetWeaver 7.0, running a Web Dynpro application as a split application has a notable limitation. The portal content model defines only iViews as the callable unit and pages, containing several iViews or other pages. However, the model does not include the concept of an application.

To overcome this limitation, the Generic Portal Application Layer (GPAL) was introduced in SAP NetWeaver CE 7.1. Using GPAL, any kind of application layer can display the list of applications, which can be launched within the portal layer (i.e., SAP NetWeaver Portal). SAP NetWeaver CE 7.1 has four types of applications, which use GPAL:

- Portal applications based on the Portal Runtime (PRT)
- Portlets following the standardized portlet specification
- Applications using the SAP Visual Composer
- Web Dynpro applications

Figure 8 shows the four application types. To select one in SAP NetWeaver Portal, click on the Content Administration tab, and then click on Portal Content.

After you deploy the StarSearch application on the SAP NetWeaver installation running SAP NetWeaver Portal, it is available under the Web

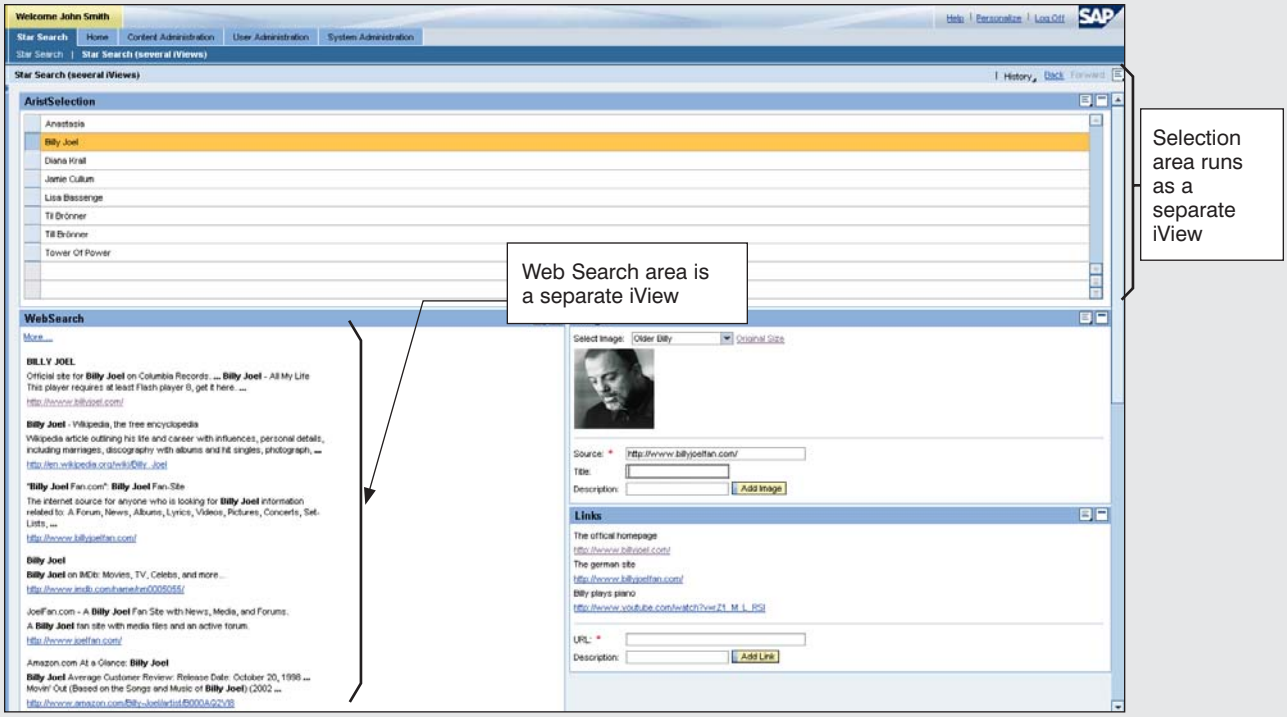

Figure 7 StarSearch running as a split application

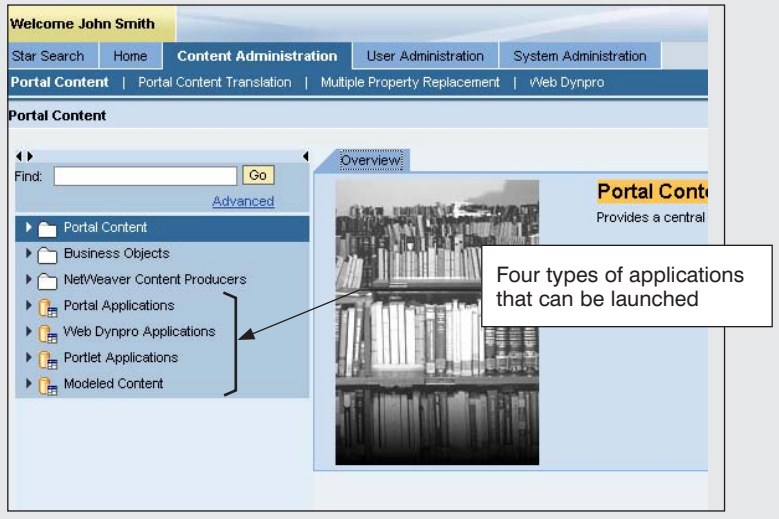

Figure 8 Types of applications available through GPAL

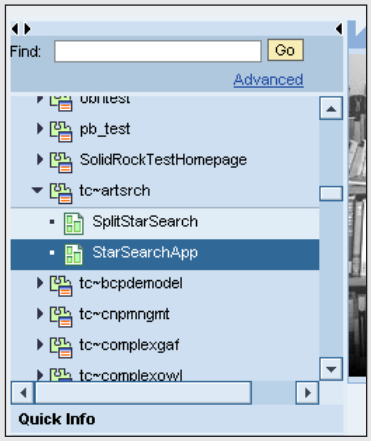

Figure 9 StarSearch application visible through GPAL

Dynpro Applications node, as you can see in **Figure 9**.

Using GPAL, a Web Dynpro application is displayed as a Web Dynpro application page. A Web Dynpro application page is a specialized Web Dynpro page that contains all of the iViews displayed by an application. For applications that display only one iView, this seems to create extra overhead, but for split applications that display a set of iViews, the application page defines the application brackets for all of these iViews. The application page represents exactly one Web Dynpro application and allows you to customize application-specific properties.

Figure 10 shows the StarSearch application page containing all the iViews that it displays.

Because a Web Dynpro application page has the typical features of a Web Dynpro page, you can define a layout for its iViews. This layout is not defined by the Web Dynpro application itself but by the application page sitting on top of it. At runtime, the Web Dynpro Page Builder arranges the screen using the specified layout. The Web Dynpro runtime provides only the single pieces — the iViews. A rich set of predefined layouts are available, including the typical one-column, three-column, and T-shaped layouts. You can also define your own Web Dynpro layouts for an application page. See the sidebar on the following page for more information.

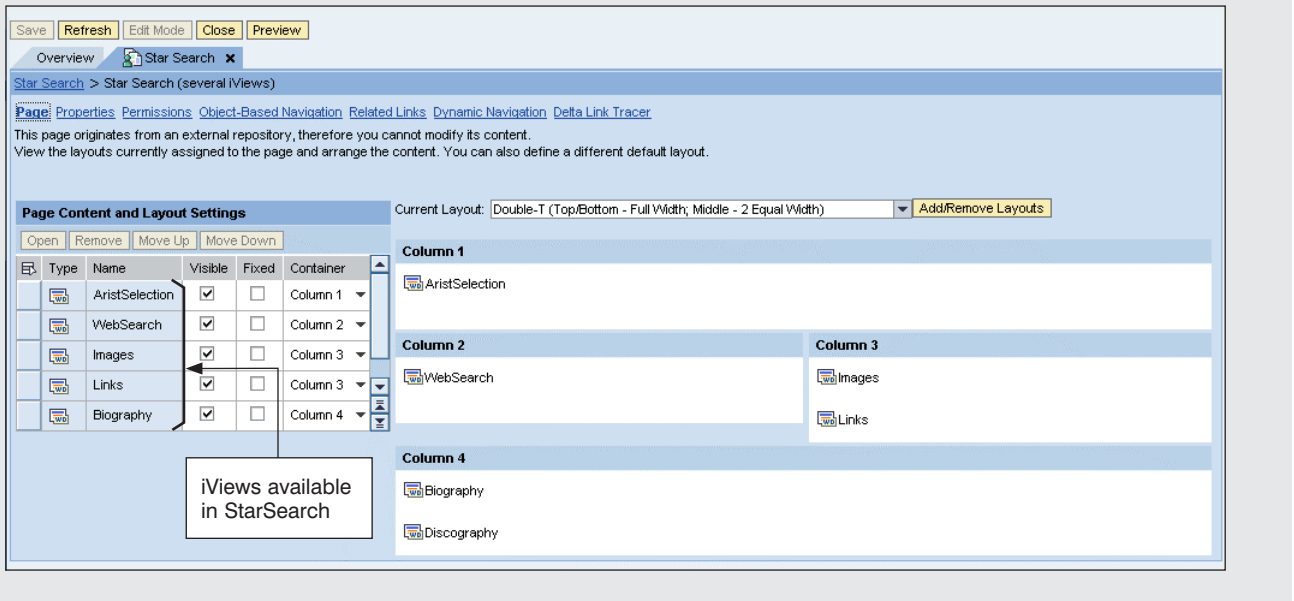

Figure 10 StarSearch application page

Using page layouts

Implementing application-specific page layouts is a good example of how Web Dynpro component interfaces can help provide a flexible application architecture. From a technical point of view, a page layout is defined by a standard Web Dynpro component interface. A component implementing this interface is visible in the portal through GPAL, similar to the way applications are visible in the portal. Inside a component implementing the mentioned layout component interface, you can use all available Web Dynpro UI elements and layout mechanisms to create complex layouts.

For example, you can define a layout based on a tab strip. Instead of showing the set of iViews that are part of the page in a typical one-column layout or T-shaped layout, the iViews are shown as tabs on the tab strip. From the user's point of view, the whole screen appears as one application. Because the screen is actually a page containing iViews, the content can be customized using the standard portal page personalization mechanisms.

Personalizing Web Dynpro applications

Running Web Dynpro applications in SAP NetWeaver Portal provides four personalization options:

- Portal personalization
- Explicit iView personalization
- Implicit Web Dynpro personalization
- Explicit Web Dynpro personalization

Web Dynpro applications can be personalized for single users or a group of users using explicit iView, implicit Web Dynpro, or explicit Web Dynpro personalization. All of these types of personalization use cases are described in the following sections.

Personalization for single users or a group of users

Single users often personalize their portal or certain applications. Typical use cases are user-specific changes to the portal look and feel, hiding UI elements for a specific application, and defining user-specific default values. These types of changes can be called end-user personalization.

In addition, certain settings often need to be adjusted for a group of users or for a specific role. Typical examples include: defining the back-end system of an application, extending the list of displayed fields, and hiding certain iViews within a page.

Portal personalization

Portal personalization is available for all types of applications running within SAP NetWeaver Portal. Therefore, portal personalization is independent from Web Dynpro. To personalize a portal, you can adjust several global portal settings such as the preferred language or the theme, which defines the look of SAP NetWeaver Portal.

To start personalizing a portal, click on the Personalize link, which is shown as part of the portal header. **Figure 11** (on the next page) displays the portal personalization dialog box, which offers several portal settings.

The Web Dynpro runtime considers all settings relevant for a Web Dynpro application. Together, the collection of settings is called the portal environment of a Web Dynpro application. One example is the defined portal theme, which is passed to the Web Dynpro runtime with other portal settings as soon as a Web Dynpro application is launched within SAP

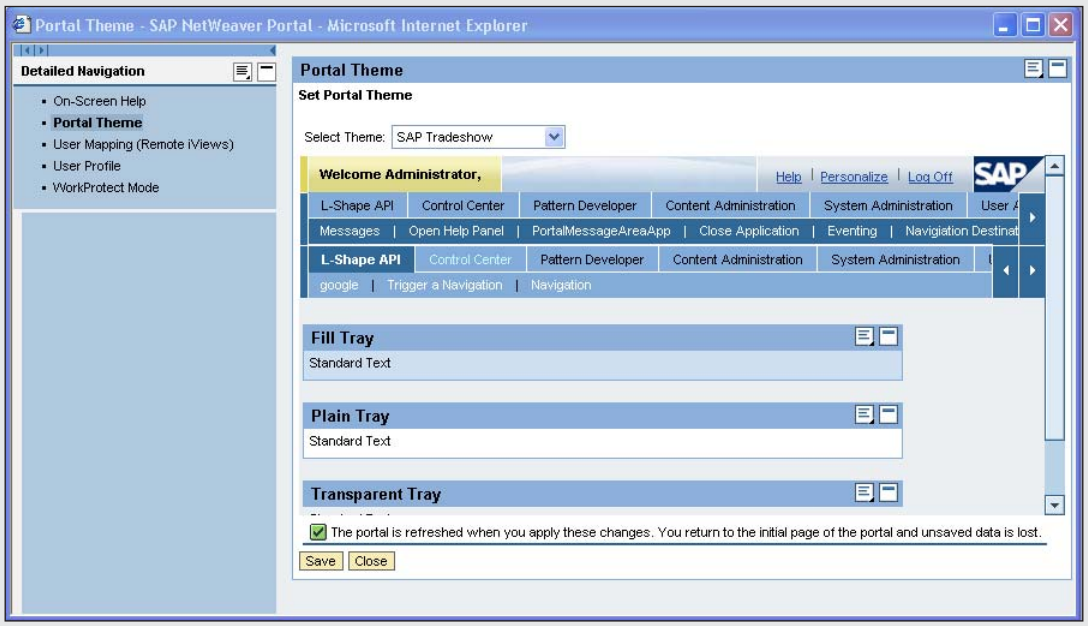

Figure 11 Portal personalization dialog box

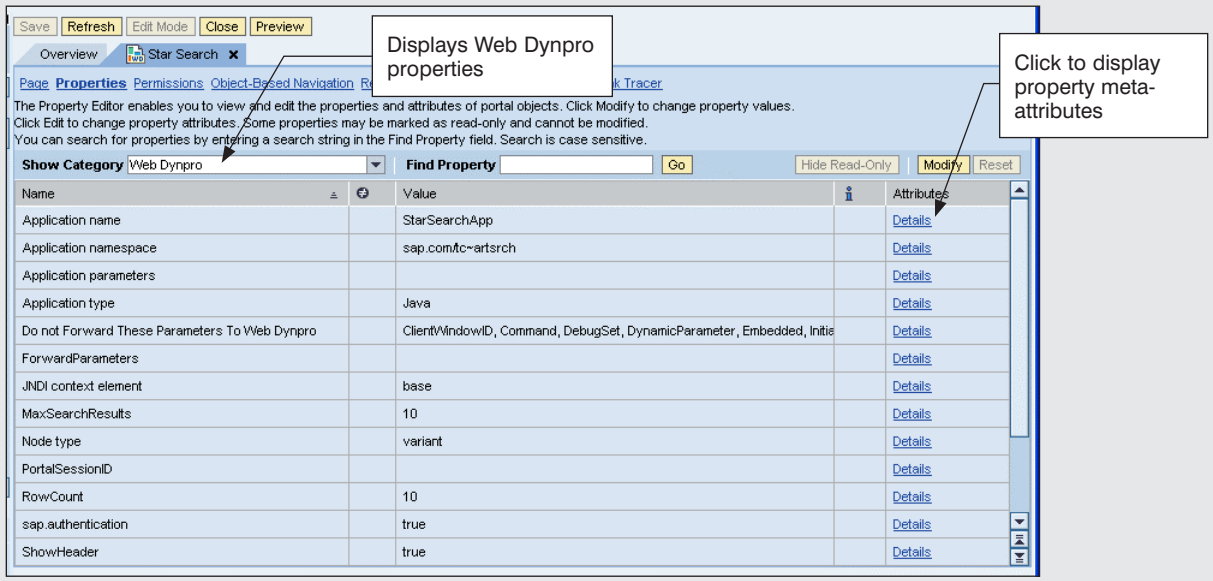

Figure 12 Properties for a Web Dynpro application page

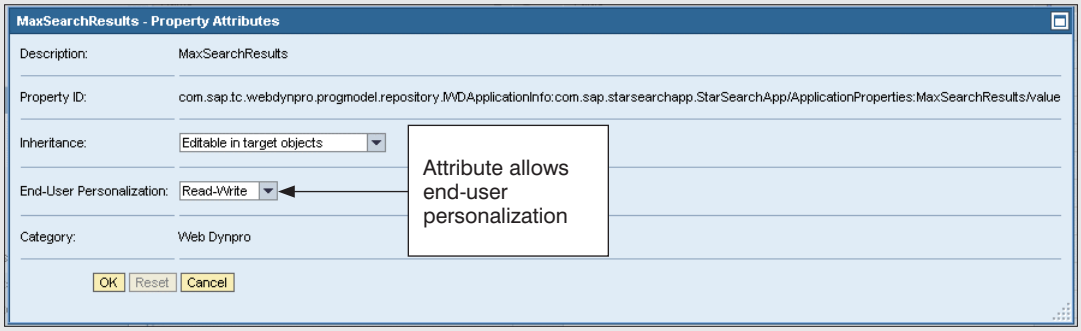

Figure 13 Viewing property attributes

NetWeaver Portal. Therefore, you don't need to handle these portal settings explicitly within a Web Dynpro application.

Explicit iView personalization

SAP NetWeaver Portal provides different types of iViews to launch nearly every kind of application. Nevertheless, some basic capabilities are available for all kinds of iViews. For example, you can *explicitly* define iView properties that you can personalize later for a user and for a group of users.

Personalizing iView properties

To personalize iView properties for a group of users, open the iView editor for the appropriate iView instance.

Click on the Properties link to access and maintain each iView property. **Figure 12** shows an example of the Web Dynpro related properties of the Web Dynpro application page that starts the StarSearch application.

Besides the concrete value of a property, you can also maintain the meta-attributes of an iView property. To do so, click on the Details link in the Attributes column. For example, you can specify whether a property should be visible for the end-user personalization, as shown in **Figure 13**.

This example shows the attributes of the iView property MaxSearchResults. By changing the End-User Personalization meta-attribute to Read-Write, the user can personalize this later.

The user can open the personalization dialog box of an iView using the Personalize command on the iView tray menu, as shown in **Figure 14**.

The personalization dialog box of an iView shows all iView properties that are available for end-user personalization. The iView is automatically restarted (using the changed properties) as soon as the user closes the personalization dialog box. **Figure 15** on the next page displays the end-user personalization dialog box of the StarSearch Web Dynpro application page.

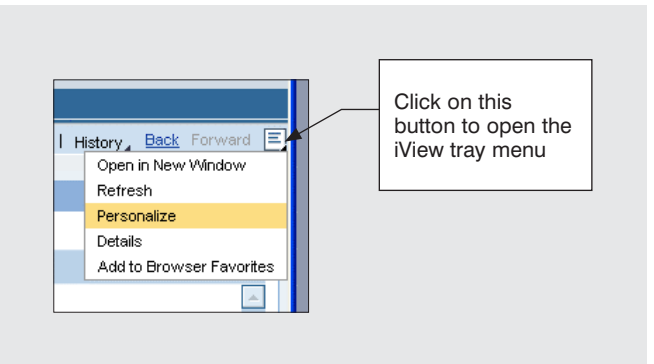

Figure 14 Personalize command on the iView tray menu

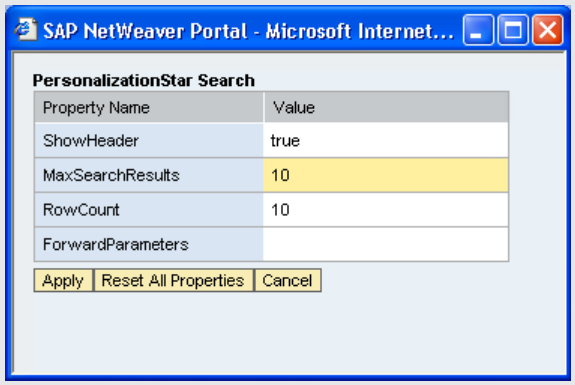

Figure 15 Personalization dialog box

Defining iView properties

For Web Dynpro application pages defined within SAP NetWeaver CE 7.1, you can specify properties for a Web Dynpro application. All of these properties are reflected on the Web Dynpro application page as soon as a page is created for the Web Dynpro application.

> ***Tip!***
>
> The explicit definition of properties for a Web Dynpro iView is *not* supported for NW04 and NW70 Web Dynpro iViews.

Figure 16 shows the defined application properties of the StarSearch application within SAP NetWeaver Developer Studio. The same properties appear as properties of the application page. You can change these properties as any other page or iView property using the page/iView editor. The following code snippet shows how to access the list of application properties within a Web Dynpro application.

```
Collection properties =
wdComponentAPI.getApplication().
   getApplicationInfo().
   getApplicationProperties();
```

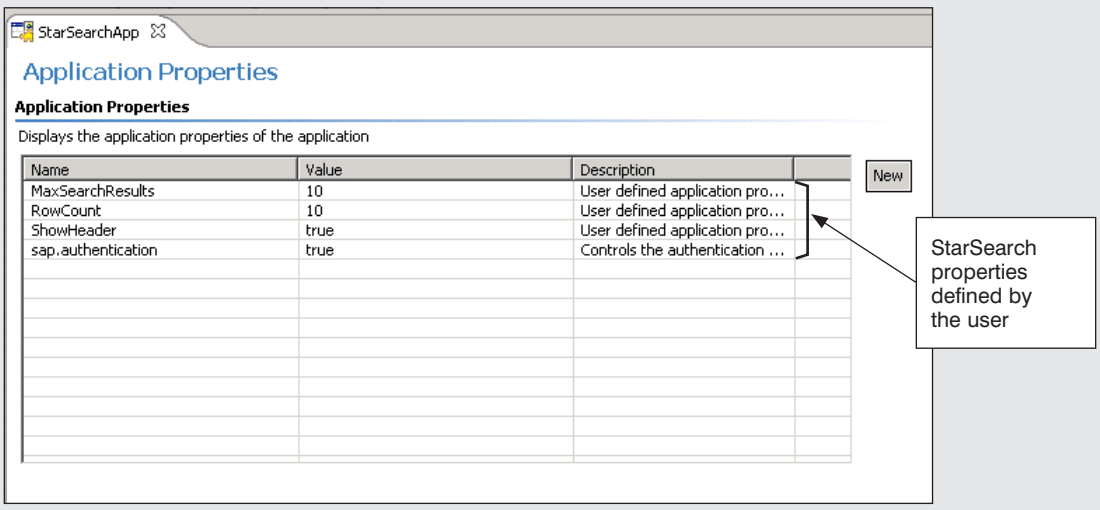

Figure 16 StarSearch application properties within SAP NetWeaver Development Studio

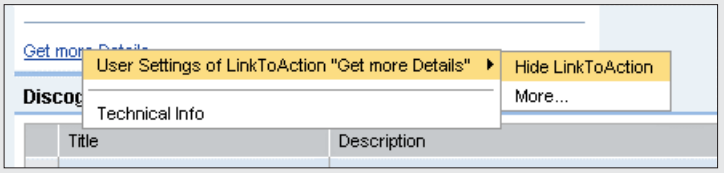

Figure 17 Context menu for personalizing a UI element

The Web Dynpro Page Builder ensures that the Web Dynpro application starts with the correct property values, including all of the changes made to the specific application page for the current role and the current user.

Implicit Web Dynpro personalization

In some cases, you might not want to explicitly define properties that can be maintained for a specific user or a group of users. For example, you might want to personalize specific UI elements, such as hiding an input field if its data is not needed, disabling a button for a group of users that does not have permission to execute the button's action, or changing the order of table columns. Although you could define the parameters for these types of changes explicitly, doing so involves at least three drawbacks:

- The list of properties quickly becomes unmanageable when you add personalization capabilities for many UI elements.
- Using the iView editor or the end-user personalization dialog box does not allow you to change the UI within the real application without starting a personalization UI.
- Access to explicitly defined properties within a Web Dynpro application requires application-specific coding.

To solve these problems, you can use implicit Web Dynpro personalization, which allows you to manipulate aspects of nearly all the available UI elements without defining explicit properties or application-specific coding.

End-user personalization

To personalize an UI element, right-click on the element to open a context menu similar to the one shown in **Figure 17**, which shows the context menu for an IWDLinktoAction UI element.

To hide the LinkToAction "Get More Details," for example, you click on Hide LinkToAction. To open a dialog box with additional options, click on More. **Figure 18** displays the personalization dialog box for the IWDLinkToAction UI element.

For more complex UI elements, more possibilities are available. For example, the IWDTable personalization dialog box allows you to manipulate which columns are shown in a table and the order in which they appear (see **Figure 19** on the next page).

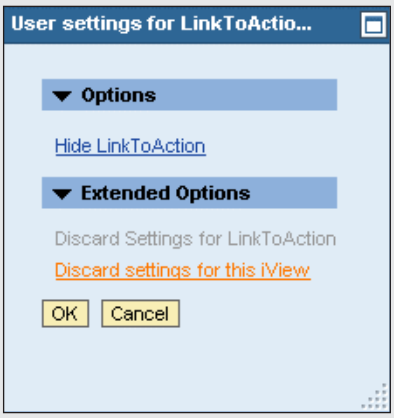

Figure 18 Personalization dialog box for the IWDLinkToAction UI element

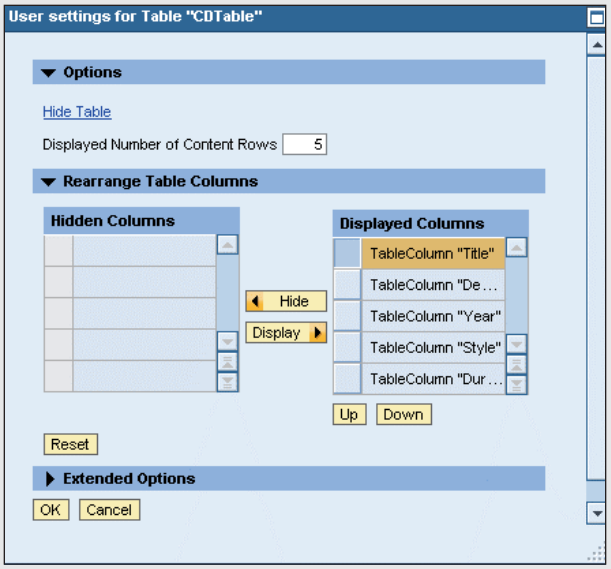

Figure 19 Extended options for table personalization

Personalization for a group of users

You can also use implicit Web Dynpro personalization to adjust an application for a group of users. To do so, you must work in admin mode using the techniques and dialog boxes similar to those used for end-user personalization.

The main difference when working with a group of users is that you must start the application not in the standard portal window but using the portal content catalog. (See the "Application pages in SAP NetWeaver CE 7.1" section earlier in this article.) Next, you run the Web Dynpro iView or application page instance using the Preview command. All changes you make in this preview mode are stored for the current iView or application page instance and are therefore available for all users running this instance.

A typical example is making a role-based change such as disabling a button when the Web Dynpro application page associated with this application is launched within a certain role. To do this using the implicit Web Dynpro personalization, you must run the application page or iView that is added to the role.

Starting the implicit Web Dynpro personalization in the admin mode offers another personalization dialog box where you can make additional changes. **Figure 20** shows the personalization dialog box for the same IWDLinkToAction UI element shown in **Figure 18**, but now it's running in the admin mode.

> ***Tip!***
>
> Using a personalization dialog box in admin mode, you can change almost any property of a UI element.

Differences between the SAP NetWeaver releases

Both SAP NetWeaver 7.0 and SAP NetWeaver CE 7.1 let you use the implicit Web Dynpro personalization.

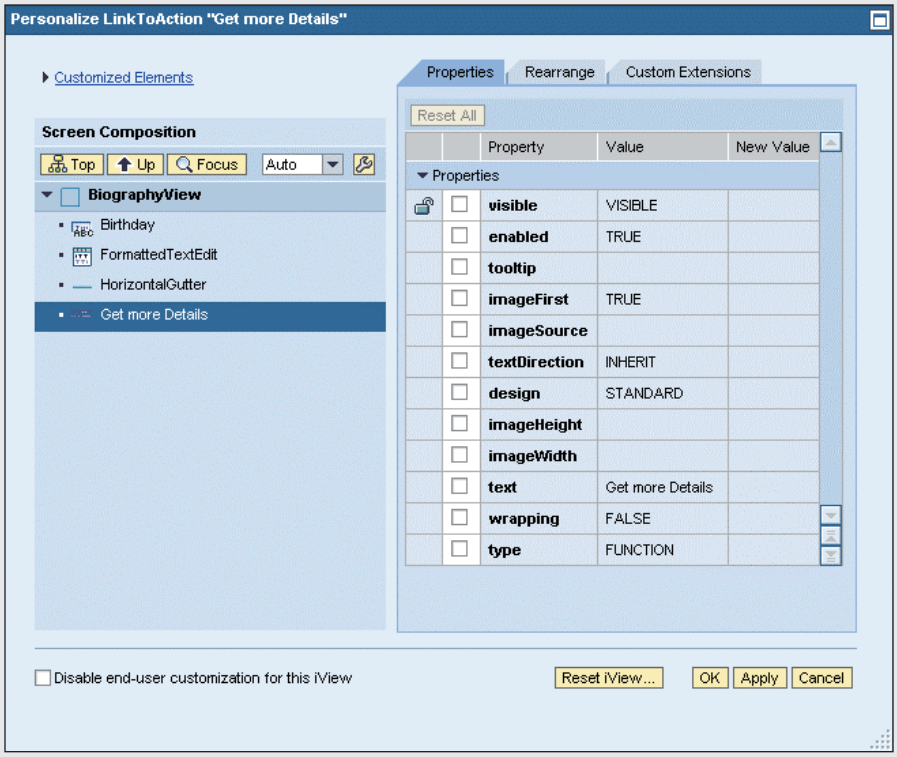

Figure 20 Personalizing in admin mode

The main difference lies in how you start it. Because Web Dynpro does not support context menus in SAP NetWeaver 7.0, you need to press Ctrl+A and then click on the UI element to display a personalization menu. Using SAP NetWeaver CE 7.1, you right-click on the UI element to do the same.

For details about the minor differences in the personalization dialog boxes in each release, follow the links provided at the end of this article.

Explicit Web Dynpro personalization

The main benefit of the implicit Web Dynpro personalization is that you don't need to define additional properties or application coding to use it. However, this approach includes a restriction: SAP predefines the properties of an UI element and the personalization dialog boxes and does not allow you to extend them.

To overcome this limitation, the explicit Web Dynpro personalization was introduced. This type of personalization allows you to explicitly define the properties and the UI. A typical use case is to personalize a generic Web Dynpro component to show table data, which is used in many Web Dynpro applications. If you want to personalize this component, you can use the explicit Web Dynpro tools to define the specific properties and the appropriate personalization dialog box for setting the properties.

Transport of personalization data

All personalization data for single end users and groups of users is stored in the PCD. This ensures

that all personalization data is handled in the same way as any other portal configuration data, which is also stored in the PCD. Therefore, personalization data is transported between different installations of SAP NetWeaver Portal using the standard export and import mechanism of the PCD.

Because of this, end-user personalization has one important restriction: End-user personalization data is by default not part of an exported portal configuration package. Only the personalization data for a group of users is part of a portal configuration package or business package.

Using portal services

Besides the role-based access to Web Dynpro portal content, one of the main benefits of launching Web Dynpro applications in SAP NetWeaver Portal is the ability to use portal services within a Web Dynpro application. Depending on the integration level between the Web Dynpro application and SAP NetWeaver Portal, different types of services are available.

With integration in SAP NetWeaver '04, only client-side interfaces are available by default because the client (e.g., the browser) is the only common infrastructure when running loosely coupled content.

When you run Web Dynpro applications within SAP NetWeaver 7.0 or SAP NetWeaver CE 7.1, which provides much tighter integration based on the Web Dynpro Page Builder, client-side interfaces and server-side services are available.

Using client-side services

The client-side services in SAP NetWeaver Portal provide integration features for running different types of content. Although the typical integration level within a portal is a loosely coupled combination of content that is sometimes heterogeneous, you need several services to run all the content consistently. For example, you might not want to run content as read-only information. The portal needs to control three elements of the application:

- **Control session lifetime:** First, the portal itself needs to control the session lifetime of applications running within it. This isn't important when the portal is mainly used to give central access to documents and other stateless resources. When the portal is used as the central infrastructure running different types of potentially stateful applications, however, the correct handing of the session lifetime is one of the portal's most important tasks. For example, the portal has to ensure that the user doesn't lose any unsaved data in a running application when the user logs off and that all of these applications are closed correctly at the end of the session.
- **Provide a communication channel:** The portal also needs to provide a simple communication channel between the portal itself, the running content, and the different applications. Automatically adjusting the displayed height of an iView is a good example of communication between the portal and the running application. The application uses client-side interfaces to inform the portal that the size of the application has changed and the portal reacts accordingly.
- **Provide navigation:** A third important feature is letting users navigate to another application and to any kind of content. All navigation relies on the role-based structuring of the available application for the current user.

The Enterprise Portal Client-Side Framework (EPCF)

The Enterprise Portal Client-Side Framework (EPCF) provides client-side functionality within SAP NetWeaver Portal. For example, the EPCF handles all session management related tasks, provides a client-side event mechanism, and allows access to navigation tools.

All of these services are accessible using JavaScript APIs, which means that they can be called by Web-based content. As mentioned earlier, a major benefit of Web Dynpro is client abstraction. However, using JavaScript calls in a Web Dynpro application does not work in a client that does not

support JavaScript. To avoid this problem, Web Dynpro offers several Java services that perform these JavaScript calls. The following sections describe the most important Java services.

Session management

Session management is performed completely from a single Web Dynpro application. The Web Dynpro runtime itself ensures that the portal session management correctly handles the lifetime of the Web Dynpro applications running within SAP NetWeaver Portal. The Web Dynpro runtime destroys all applications when the user logs off or navigates away. If the application wants to inform SAP NetWeaver Portal about unsaved data, then the developer has to use the WDPortalWorkProtectMode service. In that case, SAP NetWeaver Portal provides a dialog box, which asks the user whether to save or discard the data, to ensure that data is not lost. This dialog box is shown when navigating to another portal page or when leaving SAP NetWeaver Portal completely. The portal also displays the same confirmation dialog box the moment the user closes the browser window.

Client-side events

Handling client-side events within a Web Dynpro application is similar to handling Web Dynpro server-side events or Web Dynpro actions. A Web Dynpro application can easily send a client-side event or register for another one using the WDPortalEventing service. The Web Dynpro client-side framework maps each portal event to a Web Dynpro action.

Triggering navigation

You can trigger navigation to another Web Dynpro iView within a Web Dynpro application using the WDPortalNavigation service. In general, this service supports three types of navigation:

- Absolute portal navigation
- Relative portal navigation
- Object-based navigation (OBN)

The main difference between absolute or relative portal navigation and OBN are the semantics that define the navigation target.

To use the absolute or relative portal navigation, you define the navigation target as an absolute or relative URL. This could cause problems if the defined navigation target is moved to another location. In general, it's best to avoid hard-coding absolute or relative navigation URLs within the Web Dynpro application so that you can change them later without modifying the application code.

OBN provides a much more flexible approach. Instead of defining the navigation target with a URL, you define it using an operation of a business object. For example, the StarSearch application could use OBN to show an iView with some details of a musician. Instead of defining the navigation to a URL, such as ROLES://portal_content/spj/StarSearchApp, you could link the OBN to the Details operation of the Artist business object. The iView actually implementing this operation is transparent to the Web Dynpro application that triggers the navigation. Implementing iViews this way is part of the OBN configuration within SAP NetWeaver Portal. Typically this configuration is role-based to ensure that different types of users utilize different implementations for an operation.

Using server-side services

In contrast to the client-side services, which can be used in general by any content type running within SAP NetWeaver Portal, another set of services can be used only for applications running on the same SAP NetWeaver installation. These services fall into two groups: those provided by the Web Dynpro Page Builder using the portal service factory and those that can be called as standard portal services.

One of the most important parts of the portal platform is the PRT, which runs portal components. The whole portal UI, for example, is

implemented as a set of portal components. Using portal components provides more freedom than the Web Dynpro programming model. However, the Web Dynpro programming model does not support extended features, such as client abstraction, the strong component model, and model abstraction when using portal components. Building real business applications on top of portal components isn't recommended.

Besides portal components, the PRT can also run portal services. In contrast to portal components, portal services do not offer any UI. Instead, they provide service functionality, which is accessible within the whole portal platform. A typical example for this is the system landscape service, which provides detailed information about the system landscape the portal is running. Portal services are similar to J2EE services. They can be deployed independently from each other or reused within other services. They normally start on demand, when another portal service or application is calling the service.

Services provided by the portal service factory

The Web Dynpro Page Builder provides the portal service factory when a Web Dynpro application is running as an embedded NW70 Web Dynpro iView or a Web Dynpro application page. A Web Dynpro application can access a service provided by the portal service factory using the method WDPortalUtils.getService(). Besides services that are limited to SAP internal use, the portal service factory provides two public services: the IWDTrayService and the IWDPageService.

You can use the IWDTrayService to manipulate the iView or page tray by adding application-specific tray menu items. You can use Web Dynpro actions to implement the application logic executed when selecting an application-specific tray menu item. When running a split application, the IWDPageService allows you to manipulate the displayed portal page. You can hide an iView or add another iView to the current page via the IWDPageService.

This service demonstrates how the boundary between the application layer and the portal layer is removed step by step as it provides the Web Dynpro application a direct access to the structure and the content shown in SAP NetWeaver Portal. You can manipulate a portal page in a very similar way as you manipulate the internal view assembly of a Web Dynpro application.

Calling standard portal services

In addition to the services provided by the portal service factory, you can call many standard portal services. Any Java-based technology running on the same SAP NetWeaver installation as SAP NetWeaver Portal can use these portal services. You can access all of these portal services using a JNDI lookup. For Web Dynpro applications, the WDPortalUtils service provides the method getServiceReference(), which handles all the JNDI tasks transparently.

The next steps

In the past, when running an application in the portal, it did not matter whether the Web Dynpro application displayed the header and navigation bars in the portal frame. Due to the shape of this frame, it is often called the "portal L-Shape" or just "L-Shape" for short. Besides these visual parts of the portal, the portal frame provided most of the commonly used features, such as role-based access to an application, the event mechanisms between different iViews, and the portal session management. These portal features were not explicitly provided by a service-oriented architecture (SOA) but implicitly through the portal L-Shape. This design, however, contradicts the Enterprise SOA that SAP wants to achieve. To meet this goal, SAP created the service enablement of SAP NetWeaver Portal.

Understanding the service enablement of SAP NetWeaver Portal and its benefits helps you to see how this technology relates to SAP NetWeaver Business Client, which is sometimes called "the new SAP GUI" or "SAP's next portal." These terms are incorrect. Instead, SAP NetWeaver Business Client is the SAP's answer to the ongoing trend back to smart

or rich client technologies, which are used in addition or in contradiction to browser-based solutions.

Service enablement of SAP NetWeaver Portal

The basic idea of service enablement is to provide common functionality via standardized Web services. Do not confuse service enablement with the portal services mentioned earlier. Portal services have existed for several years and are an important way to reuse functionality within the portal platform.

The service enablement of SAP NetWeaver Portal goes one step further by introducing Web services. For example, the navigation Web service exposes the complete navigation structure of a user based on the user's roles. With the navigation Web service, you can use the portal platform to define role-based access to all kind of applications without having to show the navigation structure in the standard portal L-Shape. Theoretically, you could display this navigation structure within your Web Dynpro application using the IWDMenu UI element, for example. Building applications on a service-enabled SAP NetWeaver Portal helps you enrich your applications with typical portal features. Running an application in the portal no longer means that the application must run in the portal L-Shape.

SAP NetWeaver Business Client

Because of client abstraction, Web Dynpro can support different client technologies without any changes to its application. Therefore, you can easily run a Web Dynpro application in SAP NetWeaver Business Client.

Besides launching a single Web Dynpro application, SAP NetWeaver Business Client also offers functionality, which is usually provided by the portal L-Shape. For example, SAP NetWeaver Business Client can display applications available for a user based on a role, handle different applications launched within it, or communicate among these applications based on client-side technologies. Instead of reinventing the wheel, SAP uses the service-enablement power of SAP NetWeaver Portal. This means that SAP NetWeaver Business Client is *not* a replacement of SAP NetWeaver Portal, but another entry point to the current portal platform functionality.

What does this mean for the tasks that SAP NetWeaver Business Client can perform? The visual navigation structure per user is the same role-based navigation structure defined in SAP NetWeaver Portal. Exposed by the navigation Web service, SAP NetWeaver Business Client uses the same data but within a smart client technology. The session management of running applications is handled in the same way as SAP NetWeaver Portal. The same APIs are used for communication among applications. Therefore, all investments to set up an SAP NetWeaver Portal running Web Dynpro applications can be reused in SAP NetWeaver Business Client. Furthermore, it provides all the benefits of running a pure Windows application (e.g., faster rendering, more visual effects, and tighter integration with Microsoft Office).

Running Web Dynpro applications

What SAP NetWeaver Business Client means for your Web Dynpro portal content is that all of the content will run the same way it did before, but more quickly and with enhanced visual effects. All capabilities and services described in this article are available, because, technically, there is no difference between running a Web Dynpro application in the portal or in SAP NetWeaver Business Client. In addition, you can provide the benefits of using SAP NetWeaver Business Client, which include fast rendering and a sophisticated user experience. Furthermore, a Web Dynpro application running within SAP NetWeaver Business Client is, by default, not rendered in an HTML-based browser client, but in the Web Dynpro Extended Business Client Markup Language (XBCML) based smart client, which is the same reliable protocol used to run other Web Dynpro software. This means your portal content will be delivered with speed and accuracy and displayed as you designed it.

Helpful links

For more information on the technologies and tools discussed in this article, use the following links:

- **Integration features and tools:** http://help.sap.com and https://www.sdn.sap.com/irj/sdn. SDN is a good starting point.
- **Web Dynpro for Java:** https://www.sdn.sap.com/irj/sdn/webdynpro.

  Whealy, Chris, *Inside Web Dynpro for Java (SAP NetWeaver Essentials) Second Edition*, SAP PRESS, 2007.

  Ganz, Guertler, and Lakner, *Maximizing Web Dynpro for Java*, SAP PRESS, 2006.
- **Integration with SAP NetWeaver Portal:** https://www.sdn.sap.com/irj/sdn/ and search for "Web Dynpro," "SAP NetWeaver Portal," or "Portal Integration."

Conclusion

Rather than providing a complete technical reference of the integration features in Web Dynpro and SAP NetWeaver Portal, this article explained how Web Dynpro and SAP NetWeaver Portal have recently evolved to work together effectively as a way to build and run Web-based business applications. SAP NetWeaver '04 Web Dynpro applications used loose coupling by design, which separated the Web Dynpro application layer from the SAP NetWeaver Portal layer. This separation involved several limitations that SAP NetWeaver 7.0 Web Dynpro applications can overcome through tight coupling. To avoid the drawback of running a Web Dynpro application as a split application, application pages were introduced in the SAP NetWeaver CE 7.1 release. Finally, the service enablement of SAP NetWeaver Portal and SAP NetWeaver Business Client provides additional flexibility and power for Web Dynpro applications.

Overall, SAP NetWeaver Portal not only serves as a basic application launcher, but enhances a Web Dynpro application so it surmounts the boundary between the application layer (Web Dynpro) and the portal layer (SAP NetWeaver Portal). The results are seamlessly integrated applications and scenarios running on the SAP NetWeaver platform.

