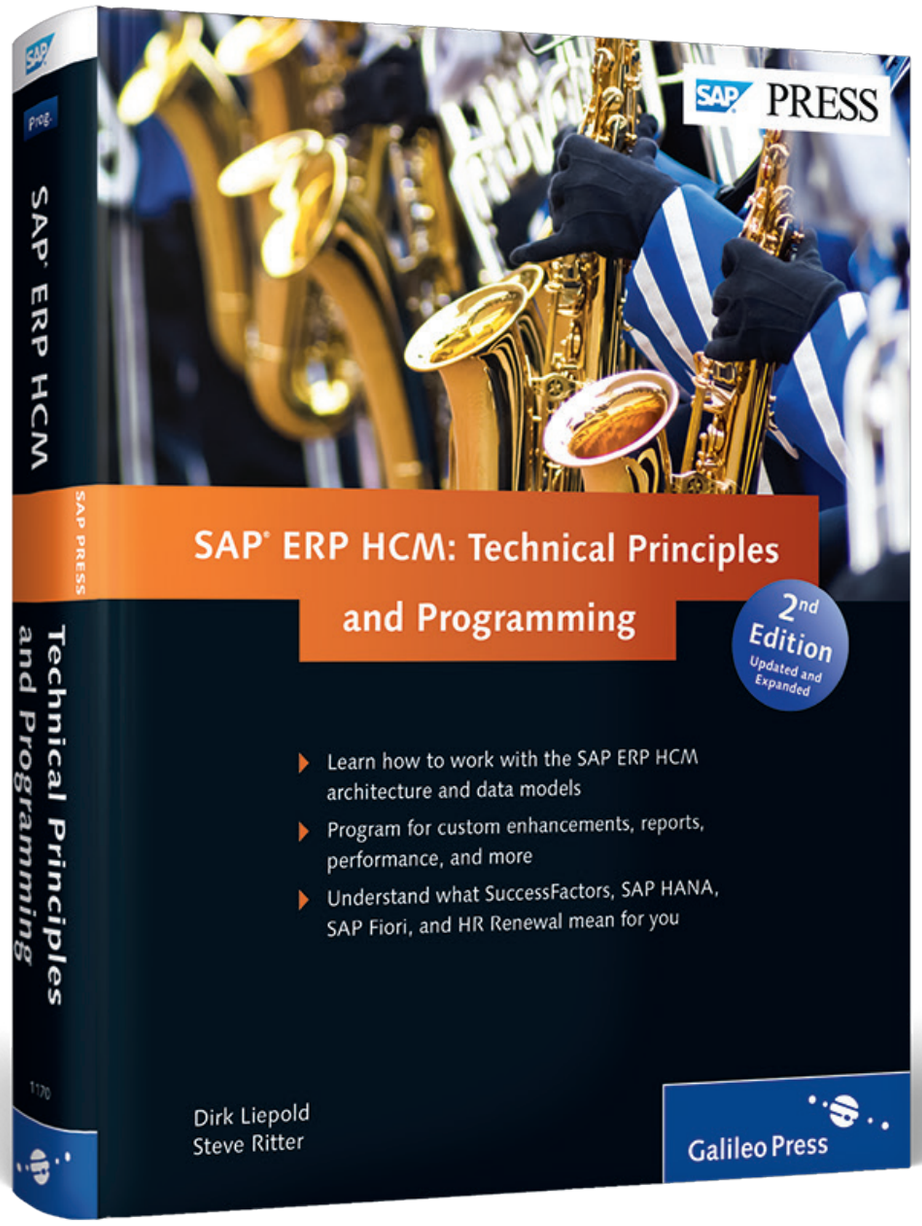

Reading Sample

In this book sample, you'll find an overview of the self-service applications offered by SAP, and the latest advances in the delivery of web-based and mobile applications. This chapter provides you with a technical understanding of the varying concepts and demonstrate some of the configuration and development tasks associated with a typical implementation.

Dirk Liepold, Steve Ritter

SAP ERP HCM: Technical Principles and Programming

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Preface

Dating back to the release of SAP R/2, the HCM application has continually evolved to meet the vast and ever-changing demands of HR business policies and governmental regulations. With each new release, the ability to customize and enhance the HCM application to meet unique requirements has increasingly improved. Combining such enhancements with a strong process integration core, SAP ERP HCM has firmly withstood the test of time in continuing to deliver robust solutions that are both flexible and efficient.

This book focuses on the unique development techniques and standard SAP tools associated with the HCM application and how they can be applied to real-world solutions. From the distributed data model represented by HR infotypes to the limitless flexibility of schemas and personnel calculation rules, we cover a substantial number of topics. In addition, we've included the most recent innovations, delivered through enhancement packages (EHPs) and add-on solutions, such as ESS and MSS on Web Dynpro ABAP technology, HR Renewal, SAP Fiori, and SuccessFactors integration with SAP ERP HCM on premise systems.

Purpose of This Book

This book serves as an introduction to SAP ERP HCM by providing a foundational understanding of its functionality and a comprehensive look at its technical composition. As with any purchased solution, there can be differences between corporate policy and the software product. This is especially the case when it comes to human resources, as many factors come into play when you are configuring the HCM solution. Government regulations, collective bargaining agreements, and established company practices create numerous additional requirements that must be incorporated and administered in the system.

Upon identification of these functional gaps and related differences, SAP provides an enhancement concept that allows tailoring the software to the customer's specifications without disrupting the core product. With this book, we assist in understanding the delivered state of the software, explore highly specialized HCM

application features, and demonstrate how enhancements safely extend the functionality of the system. We hope you find it a valuable reference tool.

Intended Audience

This book is intended for ABAP developers and technical team members who either support the application or are planning to work with SAP ERP HCM in the future. Practical knowledge of SAP and ABAP development is beneficial, as some sections of the book seek to build upon particular skill sets when discussing the enhancement framework.

Functional analysts will find the book helpful in better understanding technical concepts of the HCM application and in making them aware of the options that are available with SAP software. This will enable informed decision making regarding SAP applications and the evaluation of third-party alternatives before parting ways with the benefits of an integrated solution.

Structure of This Book

The book has been carefully constructed to guide you through a functional understanding of the software and provide a clearer perspective of the inter-relationships between the various SAP ERP HCM modules. Following the introductory overview, we'll begin to examine the technical architecture of SAP ERP HCM by way of the numerous tables and data structures that comprise the overall design, with each chapter building upon its predecessor. As customization of the system becomes necessary, we'll show you the proper methods of adapting the software to your company's needs without making modifications that can negatively impact future product upgrades.

An overview of the book layout is provided in the following list, broken down by chapter:

1. **Introduction to SAP ERP HCM**
   This chapter provides an overview of the SAP ERP HCM processes from a functional perspective. Our main focus will be on the core components, such as Personnel Administration, Organizational Management, Payroll, Benefits Administration, and Time Management. This then leads us to a discussion of other complementary components, in particular the Talent Management suite and web-enabled self-service applications.

2. **Functional Overview for Developers**
   Chapter 2 describes SAP ERP HCM's key process components and sets the stage for upcoming chapters by showing the functional aspects of each component before looking at the data structures and technologies used to implement these components. We cover the infotype framework of Personnel Administration, Time Management, and Payroll, including an explanation of the Organizational Management concept of objects and relationships. This chapter also includes an overview of schemas, functions, and operations that are unique to SAP ERP HCM and provide added flexibility in the configuration of time and payroll accounting processes.
3. **Data Structures**
   This chapter describes the data structures of the core components discussed in the previous chapter. We focus on how HR data is stored in the SAP system and fully illustrate the concept by discussing infotype and cluster tables unique to the SAP ERP HCM application.
4. **Reading and Processing HR Data**
   In Chapter 4, we discuss techniques for extracting data from HCM tables, including the use of logical databases for accessing HR data in ABAP development. We also cover programming techniques such as the use of `SELECT` statements, function modules, and HR macros for reading infotype data. In addition, we explain how to read cluster tables and update HR data using custom programs.
5. **Custom Enhancements**
   This chapter describes the enhancement techniques employed in extending the SAP ERP HCM application. We describe the process of implementing customer user-exits and Business Add-Ins and discuss how to determine when to use enhancement points to override SAP functionality to meet business requirements. This chapter uses sample code listings as an example.
6. **Enhancing Applications Using SAP Tools**
   This chapter describes how you can adjust individual components of SAP ERP HCM via SAP-provided tools. Instead of custom development, this involves more complicated customization, such as the enhancement of PA and OM infotypes or the creation of custom infotypes outside of normal system configuration. In addition, we cover how to build new organizational structure objects and relationships and how to enhance or add new payroll and time management functions and operations.

7. **HCM Reporting Tools**
   In Chapter 7, we discuss SAP ERP HCM reporting tools, as well as the use of the Data Browser and General Table Display. We cover the creation of InfoSets and their use in the QuickViewer, Ad-Hoc Query, and SAP Query. For organizational reports, we discuss the HIS reporting tool and its graphical user interface. In addition, we provide instructional use of payroll and wage type reports as well as HCM infotype audit reporting.

8. **Developing Custom Reports**
   In this chapter, we show typical reports that are required in each of the core SAP ERP HCM modules. Several programming techniques will be discussed, especially retroactive calculation in payroll, which is a challenge in custom development. We provide programming techniques on how to select employees, conduct easy date and time calculations, and read basic pay information and audit log information. Before providing an HR-specific sample of ALV reporting, we explain how to read payroll and time management data from cluster tables.

9. **HR Forms Workplace**
   Providing a better approach to HR form development, Chapter 9 discusses the introduction of the HR Forms Workplace, which facilitates the creation of SAP Smart Forms and Adobe Forms for use in remuneration statements, time statements, and other HR printable forms.

10. **HCM Interface Tools**
    In Chapter 10, we examine business objects, the BAPI Explorer, and remote-enabled function modules for open system interface architectures. In addition, we show you how to use the Interface Toolbox to supply HR data to third-party outsourcers, discuss ALE technology for connecting SAP systems, and examine the use of XML formatting.

11. **HCM Data Conversion**
    Chapter 11 discusses common HCM data conversion techniques, including the use of the Legacy System Migration Workbench and Batch Data Conversion. We offer proven strategies for effectively managing HR data migrations.

12. **Authorizations**
    This chapter explores the authorization concept and how it applies to the SAP ERP HCM application. We also discuss how to add authorizations to custom programs (especially those that do not use the logical database). After covering the main HCM-related authorization objects, we explain the concept of

structural authorization and context-based authorization. We cover how to enhance authorizations using BAdIs or custom authorization objects and explain how to troubleshoot authorization issues.

13. **HCM Performance Programming**
    Large HCM implementations sometimes have to deal with performance issues with respect to reports, interfaces, and accounting processes due to large employee populations. In this chapter, we discuss methods to improve performance, such as the parallel evaluation scheduler and how to use fast data entry for HR master data. In addition to the SAP report options, we provide guidelines on how to improve performance in custom programs by using parallel processing with a logical database and how to efficiently use internal tables and ALV programming techniques.

14. **ESS and MSS Applications**
    In Chapter 14, we cover the architecture and functionality of ESS and MSS and provide examples of navigation and establishing user access. After an overview of the HCM self-service applications, we explain the enhancement package concept, the Switch Framework, and the activation of business functions. We explore the SAP NetWeaver Business Client for Desktop and HTML and its role in delivering the latest ESS and MSS solutions based on Web Dynpro for ABAP technology. In addition, we explore SAP Fiori and the use of device-agnostic application programming to meet the demands of today's business user.

15. **HR Renewal**
    Answering the call for an improved user experience, SAP overhauled their suite of browser-based applications using HTML5 and CSS3 standards. Today, the result is a much needed enhancement for the desktop and a much anticipated alternative to SAP GUI transactions for HR professionals. Further, they have integrated Web Dynpro ABAP with HCM Processes & Forms, enabling developers to rapidly build robust HR applications. Plus, new functionality related to Streamwork, Learning Solution (LSO), and Substitutions are included in the release of HR Renewal.

16. **SuccessFactors Integration**
    The use of cloud technology is becoming more and more popular, and as clients explore the use of SAP's new HCM cloud offerings, we document the current options for integrating SAP ERP HCM with SuccessFactors. We focus on hybrid models, using data and processes between on premise and cloud solutions,

and give an overview of the possible integration technologies and scenarios provided by SAP for employee, compensation, recruiting, qualification, and evaluation data.

17. **SAP HANA and SAP ERP HCM**
    Before closing our book, we explore the impact of SAP HANA on SAP ERP HCM and what use cases are available through this new technology. We'll shed some light on the SAP terminology around SAP HANA and explain the different SAP HANA platform components. In addition, we'll touch on new SAP HANA development technologies and describe SAP HANA innovations for HCM, such as the new declustering for payroll results.

We hope you gain working knowledge of HCM technical principles and programming from this book so that you can make informed decisions regarding the implementation, enhancement options, and maintenance of SAP ERP HCM, as well as the open architecture and integration capabilities with SuccessFactors and third-party systems.

Additional Resources

Additional content is available for download from the SAP PRESS website for this book at *www.sap-press.com/3698*:

- One ALV sample program that uses methods and another that uses function modules; each includes several .TXT files and a PDF with instructions.
- Case study for custom Manager Self-Service CATS time approval delegation.

Let's begin with a high-level overview of the functional components of SAP ERP HCM. This chapter provides technical resources to establish a basic understanding of the core HCM business processes.

1 Introduction to SAP ERP HCM

In the broadest sense, human capital management (HCM)—also known as human resource management—deals with the governance of a company's employees, or its "human capital."

In its task of managing all aspects of employee records, HCM typically falls under the umbrella of enterprise resource planning (ERP) software. HCM software streamlines and automates the day-to-day record-keeping processes; it provides a framework for HR staff and managers to process benefits administration, payroll, career and succession planning, and any other aspects of employee-related data tracking, processes, and reporting.

In the context of SAP, HCM can be structured into different components that are typically aligned with the functional areas within corporations that manage these employee data processes. From a technical standpoint, the HCM processes and data are very integrated, but at the same time, the segregation of duties and roles within corporations can cause those processes to disintegrate. An example is the creation of salary information, which typically requires a division of the hiring process into two processes—the creation of nonsensitive basic employee data by one HR user, followed by the creation of supplementary salary information by another user. HCM technology and data can be very heterogeneous and split across different HCM systems and technical platforms.

All SAP ERP HCM components come with an extensive list of standard SAP reports that are included in the SAP HCM product offering. SAP BusinessObjects Business Intelligence (BI) offers standard-delivered HCM reports that can be used in addition to the SAP ERP HCM reports (assuming that SAP Business Warehouse (BW) has been implemented and the SAP ERP HCM implementation can support

these BW reports). Enhancement package 6 (and 7) for SAP ERP 6.0 offers multiple new analytics options that do not require SAP BW.

Like all other SAP solutions, all SAP ERP HCM functions support multiple languages; some SAP ERP HCM components even contain country-specific functionality to cover country-specific requirements for Personnel Administration, Payroll, Employee Self-Service, and others.

Whether the SAP ERP HCM development project you're working on is a new implementation or an add-on implementation for additional functionality, you'll always encounter a variety of HCM processes, business rules, and technology scenarios, so one HCM solution does not always fit all.

In this chapter, we focus on SAP ERP HCM "on premise," formerly known as SAP HR. Some clients use SAP ERP HCM for all their HR processes, while others use a mix of SAP HCM on premise components supplemented with SAP HCM cloud components and/or third-party HR systems. A typical example is a client that uses SAP ERP HCM for the Personnel Administration (PA) component but out-sources gross to net payroll processing to a payroll solutions provider such as ADP.

Just as SAP ERP HCM functionality has evolved over time, the SAP terminology for the different HCM product offerings has changed from the early R/2 releases to current versions. With the acquisition of SuccessFactors, the SAP HCM product offerings are differentiated between *on premise* and *cloud* solutions, where on premise solutions are represented by the traditional SAP ERP HCM core components installed on the customer system and maintained by the client, and cloud solutions are defined by applications residing within SuccessFactors, hosted by SAP in the cloud. Some SuccessFactors components such as Employee Central and Employee Central Payroll are redundant with the SAP on premise offerings, but most of the SuccessFactors Talent Solutions, Analytical Solutions, and Social Collaboration functionality supplement the traditional SAP ERP HCM functionality. We'll explain in Chapter 16 what the typical implementation scenarios for SAP HCM on premise and cloud solutions are and how both solutions can be integrated.

Note

As the focus of this book is SAP ERP HCM as part of the SAP ECC Business Suite of applications, we'll concentrate on the on premise core functionality, using the SAP terminology and structures of the current SAP ERP HCM system for each of the functional areas.

1.1 Developer's Responsibilities

The core responsibilities of an SAP ERP HCM developer are to assist in the customizing and enhancement of the individual components to fill potential functional "gaps" within the SAP standard-delivered HCM product, to write custom reports from the underlying data, to write custom data load programs to load legacy data into the SAP system, and to write custom interfaces to integrate third-party products into the SAP ERP HCM solution. Therefore, as an SAP ERP HCM developer, you need to have good working knowledge of the components, and the underlying architecture, within SAP ERP HCM from both a functional and technical viewpoint.

To design the best solution for a custom development, the SAP ERP HCM developer has to work closely with SAP ERP HCM functional subject matter experts. It's essential that in the design and blueprint phase, during which functional and technical design documents are developed and finalized, the developer closely communicates with the functional experts and understands the fundamental requirements of their respective HCM process areas. In order to achieve optimal results, the functional expert should have enough technical knowledge and familiarity with the SAP ERP HCM development terminology, and the developer should know the basics and terminology of the functional HCM processes and SAP ERP HCM configuration basics.

The following sections give an overview of the functionality that resides within the core SAP ERP HCM components required to run a company's HR business. In addition to covering the core HR components (Section 1.2), we'll also discuss the other strategic components that allow companies to run more sophisticated human resource management processes, including performance management, organizational competencies, and self-service functionality for employees and managers (Section 1.3).

1.2 Core Components

In order to run the "bare-bones" HR processes and manage the most important employee data, core HR functionality is required. In the following sections, we describe the high-level functionality built into the essential SAP ERP HCM core components:

- Personnel Administration
- Organizational Management
- Payroll and Benefits Administration
- Time Management

However, not all components need to be implemented at once. The core components of Personnel Administration and Organizational Management form the basis for many other components. Payroll, Benefits, and Time Management are central functions within every corporation and are typically implemented next. The more strategic components, such as Talent Management and ESS/MSS, are typically implemented after the core functions within SAP HCM have been established.

1.2.1 Personnel Administration

Personnel administration is the foundation of employee data management and entails typical human resources administration processes such as employee hiring and termination, employee change of organizational assignment, and so on.

Within this process area, core employee information is captured, and employee life events are tracked accordingly, thus laying the foundation for managing downstream HCM processes such as time management, payroll, and benefits, which are highly dependent on accurate basic employee information. Most HCM and payroll processes depend on basic personnel administration data that drive and impact the downstream processes—for example, the master data administered within the SAP ERP HCM Personnel Administration (PA) component for marital status or number of dependents, which impact payroll calculations and benefits eligibility.

Globalization enforces the need for both national and global views of employee headcount and data, so in recent years, the typical role of the human resource function has been transitioning from an administrative role to more of a strategic role. Human resource professionals working in field HR or corporate HR functions use personnel administration data and tools for both low-level employee data entry processing and high-level strategic analysis and reporting. SAP ERP HCM data, processes, and reporting capabilities simplify the day-to-day work of HR professionals by providing a single point of access to all personnel-related data.

1.2.2 Organizational Management

Organizational management processes handle the definition of the corporate organizational structure and the assignment of employees within the organizational structure, defining roles and responsibilities within the corporation as well as reporting relationships. The organizational structure builds the foundation for workflow processing and delivers a framework for sophisticated yet flexible authorizations around HCM processes and data.

The definition of organizational plans within the corporation and the definition of individual organizational units, positions, jobs, work centers, and cost centers in current and planned versions is the core of the SAP ERP HCM Organizational Management (OM) component.

1.2.3 Payroll and Benefits Administration

The Payroll (PY) component in SAP ERP HCM is responsible for employee payment based on company policies and state and federal regulations. The foundation of this component lies in the administration of employee salary via the definition of basic pay/salary and pay scales. The payroll engine contains all the logic to calculate gross to net payments based on salary and recurring payments and deductions, such as employee bonuses, special payments, garnishments, pension contributions, and benefits deductions. Depending on the employee type, attendances and absences are taken into account. For example, hourly employees would get overtime payments or pay deductions based on time data, absences, and attendance; these are collected via a time data collection process and passed on to the payroll engine.

Besides determining the gross portion of employee pay, the payroll engine also calculates tax deductions based on the specific tax rules per employee. This functionality includes regular payroll processing by pay period, as well as quarterly and yearly tax reporting to authorities and provision of legal forms to entities and employees.

Check and pay stub printing and distribution, as well as electronic transfer of funds to banks and other third-party entities, are part of the responsibilities and functionalities within the PY component. Companies operate their corporate payroll systems in a variety of ways; some use a very integrated approach and run all payroll processes in-house and on one integrated system platform, while others outsource all or some of the payroll processes.

Payroll tasks can be integrated or delegated in the following ways:

- HR and payroll are on one integrated system platform.
- HR and payroll are on different systems connected via interfaces.
- HR gross payroll is on one system, but net processing and tax reporting is outsourced and data are sent to an outsourcing provider via interfaces.

Meanwhile, the Benefits Administration component in SAP ERP HCM handles the processes and data for administering benefits programs for a variety of different benefits plans such as health and welfare, life insurance, savings plans, spending accounts, and pension programs. The foundation for benefits administration is the definition of the various benefits plans, eligibility and termination rules, and the breakdown of employee and employer costs and contributions.

In addition to the administration of the benefits data, the benefits enrollment process is an integral part of the process; as with payroll systems, there are many different ways to implement this function at various companies. Some companies offer employees self-service benefits enrollment functionality to allow the employee to make plan selections on one integrated platform; other companies outsource benefits plan administration and enrollment processes altogether and then interface the benefits deductions into the payroll system. Using electronic or manual paper forms is another common way of collecting benefits enrollment data.

The withholding of benefit premiums is tightly integrated with payroll processing, but it can also be outsourced to third-party administrators and interfaced as a recurring deduction to the employee.

The benefits administration as well as the payroll administration functions and rules are highly dependent on country, legal, corporate, and union-specific requirements and can vary dramatically between companies in different industries.

1.2.4 Time Management

Time management covers all processes and data related to time capture and time data processing. Time entry, time approval, and time evaluation are the core processes within SAP ERP HCM's Time Management (PT) component. As with other components, there are a slew of ways to capture and manage time, and companies

use different time entry processes for different types of employees or contractors. Employee work schedules, absences, attendances, and time quotas represent the core data within time management. The raw entered time can be evaluated based on corporate and/or federal rules to calculate overtime, shift premiums, unpaid and paid absences, and holiday and vacation pay, which is used as an input into payroll to calculate employee pay.

Different processes, devices, and techniques are used for time capturing, (e.g., clocks with swipe cards, biometric clocks, scanners, kiosks, Interactive Voice Response [IVR], web-based employee self-service, paper-based time collection, and time entry via central time keepers).

There are a variety of different strategies and system platform philosophies implemented to integrate time management and payroll data and processes. Some companies run personnel administration, time management, and payroll on one integrated system platform, whereas others separate time collection and time management from the personnel administration and payroll processing and feed data via interfaces between systems.

1.3 Other Components

Besides the core HR processes essential to running a company's HR business, SAP ERP HCM offers a multitude of additional functionality within the on premise solution for more strategic functions that are covered under Talent Management, plus an entire suite of Employee Self-Service and Manager Self-Service functions.

First, let's explore Talent Management, which can be divided into four main modules:

- **Performance Management**
  The main business processes supported by this component include the tracking of team or individual goals and performance review and appraisal. Employee development tools allow users to manage career plans and succession planning.
- **E-Recruiting**
  E-Recruiting supports the end-to-end recruiting process from managing and posting job openings to tracking candidates to scheduling interviews and searching for skills and talent.

- **Compensation Management**
  Compensation Management allows managing competency-based pay, variable pay plans, and incentive programs supported by Manager Self-Service functions. In addition, it allows comparative compensation package analysis based on external salary data.
- **Enterprise Learning**
  This component supports both e-learning and classroom training, as well as synchronous and asynchronous collaboration. It allows managing and tracking of learning material, learning sessions, trainees, competencies, and certifications and proficiencies. Enterprise Learning is integrated with other SAP applications such as OM and PA, where organizational units or employees can be booked as course attendees or employees can be scheduled as instructors. Attendance records can be automatically created for course participants as an integration into the Time Management (PT) component.

  The SuccessFactors BizX suite offers most of the Talent Management functions as a cloud solution; you'll encounter different scenarios where clients have "hybrid" solutions with integration between the core on premise and cloud functions.

Employee Self-Service (ESS) and Manager Self-Service (MSS) offer numerous web-based functions, with the emphasis on "self-service." These functions allow users to access and maintain backend HCM data without involving an HR professional. To enable the use of certain ESS or MSS functionality, the associated SAP ERP HCM backend functionality has to be implemented to support the ESS or MSS function along with the necessary configuration. For example, you cannot use the standard SAP ESS Salary Statement display if you have not implemented SAP Payroll processes.

The following are the most common Employee Self-Service applications included in the latest release of standard SAP ERP HCM:

- Salary Statement
- Total Compensation Statement
- W4/W5 Tax Withholding
- Benefits Enrollment/Confirmation
- Leave Request
- Time Statement

- Time Entry
- Personal Data
- Permanent Residence
- Bank Information
- Emergency Contact
- Dependent Data
- Appraisals and Development Plans
- Skills
- Travel Request and Expense Report

Here are the most common Manager Self-Service applications included in the latest release of SAP ERP HCM:

- Team Viewer
- Universal Worklist (UWL) or Personal Object Worklist (POWL) for workflow and delegation
- Leave Request Approval
- Personnel Change
- Team Calendar
- Appraisal
- Time Sheet Approval
- Compensation Adjustment
- Compensation Planning
- Manager Analytics Reporting

1.4 Summary

The HCM component within SAP ERP is a robust solution that allows an organization to manage all aspects of its human capital. Due to the tight integration of HR data and processes, we recommend that you use an integrated HCM system rather than a loosely integrated system requiring interfaces between different technologies and resulting in a loss of the benefits of real-time information. In addition, SAP ERP HCM has integration points to other dimensions of ERP; for

example, the labor costs that are generated by the payroll process need to be transferred to accounts within finance. If HR and FI reside within SAP, then the benefit of integration is even greater. Another example is labor cost tracking via the time entry process against cost centers, work orders, or project codes. If your finances, project systems, and materials management all reside within SAP, then you can maximize the benefits of integration.

This book will guide you through the various components, technologies, and common tools that you need to know about to be an effective SAP ERP HCM developer. In the next chapter, we illustrate the tables, screens, and technologies used in SAP ERP HCM to store and manage HR data.

Note

In order to gain greater insight into the overall SAP ERP HCM functionality, we recommend *Mastering HR Management with SAP ERP HCM* by Sven Ringling, Jörg Edinger, and Janet McClurg (SAP PRESS, 2009).

For more details on specific SAP ERP HCM components, we recommend the following resources:

- *Practical SAP US Payroll* by Satish Badgi (2nd edition, SAP PRESS, 2012)
- *Talent Management with SAP ERP HCM* by Joe Lee, Tim Simmons, Jon Jenkins, and Luke Marson (SAP PRESS, 2012)
- *Configuring and Customizing Employee and Manager Self-Services in SAP ERP HCM* by Martin Gillet (SAP PRESS, 2012)
- *Self-Services with SAP ERP HCM: ESS, MSS, and HR Renewal* by Kris Bland, Jeremy Masters, Justin Morgalis, and Brandon Toombs (SAP PRESS, 2015)

With the increasing use of self-service applications, HR professionals can spend less time performing routine tasks. Employees can maintain their personal data and submit requests related to time and payroll processes, and managers can access real-time reporting tools to get the information necessary to make quick and efficient decisions.

14 ESS and MSS Applications

As Internet technology blossomed in the late 1990s, web-enabled applications provided an increasingly reliable method for employees to take ownership of their personal information. HR administrators were liberated from performing commonplace, repetitive tasks and could focus instead on efforts more beneficial to the company. Another byproduct of implementing web-based employee services was the sizeable reduction in the corporate paper trail and data entry errors.

In this chapter, we'll discuss the self-service applications offered by SAP and the latest advances in the delivery of web-based and mobile applications. Although the content could fill an entire book, we'll at least provide you with a technical understanding of the varying concepts and demonstrate some of the configuration and development tasks associated with a typical implementation. Before we examine the specific services offered with Employee Self-Service (ESS) and Manager Self-Service (MSS) more closely, we first present an overview of current SAP self-service applications. In Section 14.2, we show you how these services are installed and activated through the use of enhancement packages. After they have been made ready for use, you'll need to provide access to your users. In Section 14.3, we show you how this is accomplished through SAP NetWeaver Business Client, which can be an alternative to the SAP Enterprise Portal. Following this introduction, we start our discussion of ESS and MSS desktop applications using Web Dynpro for ABAP, a versatile mobile/on premise app called SAP Fiori, and screen personas with SAPUI5.

Let's begin by providing a quick overview of the delivered HR self-service applications for SAP ERP HCM.

14.1 HCM Self-Service Applications

The audience for HCM self-service applications consists of employees, managers, and HR administrators. In fact, with SAP E-Recruiting, even external candidates have access to submit applications and apply for positions within your organization. However, the focus of this chapter is on the internal organization and the concentrated areas in which services are delivered:

- Employee Self-Service
- Manager Self-Service
- HR Administrative Services
- Employee Interaction Center

In each of these areas, the technical architecture and delivered services have undergone numerous changes as they have evolved over the past 15 years. The constant technological shift within the industry has created an ever-moving target for both SAP and their development partners. Even in the past year, the focus has quickly shifted to mobile applications for tablets and smart phones.

Before we begin a technical discussion, we first provide some background and additional insight into each of the service delivery areas.

14.1.1 Employee Self-Service

Employee Self-Service applications give employees the ability to access their own information from the backend ERP system. Not only can employees view their current information, but they can also update certain master data such as permanent residence, emergency contacts, bank details, and W4 tax withholding. In addition, they can submit leave requests, send employment verification details to third parties, and access corporate HR documents.

The early versions of ESS were delivered using *Internet Transaction Server* (ITS) and HTML technologies, which employees could access through their corporate intranet portal. Following this, the SAP Enterprise Portal was introduced as a means to better organize the various ESS applications and provide more efficient navigation for employee activities.

Recently, SAP converted all of their current ESS applications to the Web Dynpro for ABAP technology for customers not currently using the SAP Enterprise Portal.

Now, both portal and non-portal customers can access the ERP system directly; we cover this in more detail in Section 14.4.

14.1.2 Manager Self-Service

To enable managers to access real-time information and perform their administrative duties, SAP released *Manager Self-Service* in conjunction with the SAP Enterprise Portal (previously called SAP NetWeaver Portal). Managers could approve employee requests and initiate personnel change requests. Some of the first services available included time input and leave request approvals, form-based requests for employee transfers and terminations, and increased reporting capability.

For the form-based request processes, SAP introduced HCM Processes and Forms, using SAP Interactive Forms by Adobe, which provides an Adobe PDF form incorporating the ERP backend for additional look-up and validation functionality. To provide functionality to non-portal customers, SAP later announced the release of Manager Add-On 1.0 (requiring EHP 5) in December 2011 as an alternative to both the SAP Enterprise Portal and HCM Processes and Forms technology based on Interactive Forms by Adobe.

In Section 14.5, we cover the latest enhancements for Manager Self-Service and Manager Add-On 1.0 in more detail.

14.1.3 HR Administrative Services

Recognizing that not all HR processes should be limited to initiation by only employees and managers, SAP released *HR Administrative Services* with EHP 2, which enabled HR personnel to trigger HCM Processes and Forms requests. A new portal role, HR Administrator, contained services to administer performance appraisals between supervisors and employees, initiate master data updates without SAP GUI access to the ERP system, and distribute confirmation forms and employee statements. Also, forms generated within SAP could be placed in the *Digital Personnel File* (DPF), which is a centralized repository for the storage of employee-related documents.

HR Administrative Services was released fully integrated with the Employee Interaction Center, where service center agents could perform personnel processes on behalf of employees. However, in the past year, SAP has placed an emphasis on

HR professional applications and invested in an improved user interface through the release of HR Renewal, which we'll discuss in greater detail in Chapter 15.

14.1.4 Employee Interaction Center

The *Employee Interaction Center* (EIC) originated from the SAP Customer Relations Management (CRM) component; services provided in that application were somewhat comparable to the activities typically performed by HR professionals. Eventually, SAP released the HCM-centric EIC with integration of HCM Processes and Forms. As part of EHP 2, it coincided with the release of HR Administrative Services.

The two business functions were tightly integrated to improve the flow of HR documents between shared services agents and HR administrators. Using the new functionality, EIC representatives could submit personnel change requests, retrieve employee documents stored in the DPF, and actively monitor the status of form processes.

The EIC methodology fits nicely with the requirements of many collective bargaining agreements, as union employees are often required to have access to HR representatives to assist them with updates to their own information and in the submittal of time, payroll, and benefits requests. In addition, with an EIC implementation, company costs were reduced by eliminating the additional licensing expense associated with most ESS applications during that time.

Each of these self-service offerings has evolved over time with the delivery of new functionality through enhancement packages. In the next section, we explain in more detail how enhancement packages continue to drive innovation related to self-service applications.

14.2 Enhancement Packages

Before we discuss ESS and MSS in greater detail, you should first understand the method SAP employs to deliver additional content related to their recent evolution. Originally, scheduled maintenance of the SAP ERP system involved the application of standard releases known as *support packages*. The support package concept introduced corrections to existing functionality and necessary changes to

business processes for meeting legal requirements. However, they also contained new development objects and application improvements that could alter business processes and thus require additional testing and training. This created an obstacle for customers who required only necessary corrections and wanted to avoid the time and effort associated with the implementation of a software upgrade. To reduce the disruption caused by support packages, they would often implement multiple support packages at a later date to justify the related expense and effort.

Also, industry-specific solutions (e.g., oil and gas, healthcare) would delay the release of support packages for unrelated business functions, as they had to be adapted for the add-on industry solution and the underlying R/3 system before they could be applied. This further impeded the effort of enterprise business processes, such as HCM, from implementing the necessary and timely corrections to meet legal obligations.

Recognizing the difficulty customers faced, SAP began separating new development and add-on solutions from core product corrections through the introduction of *enhancement packages*, promoting the concept as "stability plus innovation." Business users now had the choice to implement the latest functionality according to their own schedule while at the same time effectively maintaining the system. As shown in Figure 14.1, enhancement packages should be applied with support packages as part of the SAP ERP maintenance routine. Table 14.1 provides a list of the enhancement packages that have been released since 2006.

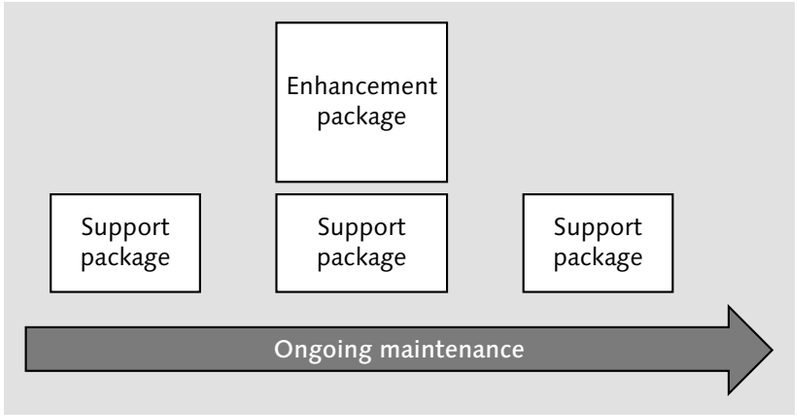

Figure 14.1 Enhancement Packages and Scheduled Maintenance

Enhancement Package	General Availability
EHP 1.0	December 2006
EHP 2.0	November 2007
EHP 3.0	May 2008
EHP 4.0	May 2009
EHP 5.0	May 2011
EHP 6.0	May 2012
EHP 7.0	August 2013

Table 14.1 Enhancement Package Releases

Once an enhancement package is installed, it isn't visible in the system until it's been activated. Thus, there's a separation of the installation of an enhancement package from the subsequent activation, which we cover in Section 14.2.2. However, let's first discuss the elements that make up an enhancement package.

14.2.1 Enhancement Package Components

To better understand how SAP delivers new functionality related to self-service applications, it is important to know the terminology and technical components surrounding enhancement packages:

- **Technical usage**
  A grouping of business functions that must be implemented together to install a desired solution, such as HR Administrative Services. When selecting an enhancement package from the Maintenance Optimizer, you also need to select the technical usage, which then provides the necessary download files for the install. The technical usage can span product instances, such as when both SAP ERP and SAP Enterprise Portal objects are required for implementation of the solution.
- **Business function**
  A subcomponent of the technical usage that contains all development objects, menu options, IMG activities, and authorizations for a solution. It is the activation of a business function that generates the objects and makes them visible and ready for use.

- **Business function set**
  Logically related grouping of business functions specific to an industry solution, such as oil and gas, healthcare, or utilities, which should be activated together. Business function sets can also include the business functions of more than one business function set where the industry solutions may be linked, such as SAP Oil & Gas with Utilities.
- **Switch**
  Switches are contained within the business function and, when activated, trigger the generation of new objects in the ERP system. It is the activation of a business function that then sets the switches to begin loading the system.

After an enhancement package has been installed, the associated business functions are available to be viewed via Transaction SFW5, which we cover in the next section. The documentation provided by this transaction contains the release notes and installation procedures accompanying each business function.

In Table 14.2, business functions related to HCM self-service applications are listed according to the enhancement package in which they were released. From this table, you can see the progressive changes that have been made to the self-service applications, especially the transition to Web Dynpro for ABAP—based solutions in recent releases. For EHP 7.0, we cover the associated business functions related to HR Renewal in Chapter 15.

EHP Release	Business Function	Description
602	HCM_ASR_CI_1	HCM, Administrative Services 01
602	HCM_EIC_CI_1	HCM, Employee Interaction Center 01
603	HCM_ESS_CI_1	HCM, ESS for Personal Information
604	HCM_ASR_CI_2	HCM, Administrative Services 02
604	HCM_EIC_CI_2	HCM, Employee Interaction Center 02
605	HCM_ASR_CI_3	HCM, Administrative Services 03
605	HCM_ESS_WDA_1	ESS on Web Dynpro for ABAP
605 (1.0)	HCM_MSS_WDA_1	HCM, MSS on Web Dynpro for ABAP
606	HCM_ESS_WDA_2	ESS on Web Dynpro for ABAP 2

Table 14.2 HCM Self-Service Business Functions

EHP Release	Business Function	Description
606	HCM_LOC_CI_29	HCM WD ABAP—U.S. Online W2
607	HR Renewal 1.0 Business Functions	Refer to Chapter 15 for the latest HR Renewal functionality

Table 14.2 HCM Self-Service Business Functions (Cont.)

Next, we cover the activation of the business functions using the Switch Framework and the resulting processes that are triggered.

14.2.2 Switch Framework

The *Switch Framework*, released with SAP NetWeaver 7.0, controls the activation of newly enhanced functionality and add-on solutions for SAP ERP through the business functions in which they reside. As we mentioned before, business functions remain dormant until they are activated. This activation step initiates the generation of multiple development objects and reference documents within the system for the targeted solution. A business function is linked to its development objects through switches, which are triggered by the activation of the business function.

To activate a business function, such as HCM_ESS_WDA_1 for the ESS Web Dynpro for ABAP solution, use Transaction SFW5 (Switch Framework Customizing). Upon first entering the transaction, you'll receive a Security Information dialog box warning about the effect that activating business functions may have on the system. Most business functions are nonreversible and cannot be switched off once they have been activated. There are very few business functions dealing with security roles and other minor updates that can be reversed. However, always treat the activation of a business function as a point of no return. Click the Continue button to proceed to the Switch Framework screen.

Note

The activated changes of a business function are nonreversible and cross-client, meaning they'll affect all clients of the system. The best strategy for enhancement package and business function evaluation and activation is to initially use the sandbox environment. Once evaluation and testing are complete and the changes related to the business function are accepted, you can activate the business function in the development environment.

As shown in Figure 14.2, the Switch Framework customizing screen displays the list of business functions currently available within your system. There are two folders in which business functions reside:

- Enterprise Extensions
  Initial business functions that provided additional solutions for applications, such as EA-HR (see Figure 14.2) for HCM, which contained the first-generation versions of ESS, HR Administrative Services, MSS, and Compensation Management functionality. The extensions are no longer used, as they were the initial foray into the Enhancement Framework.
- Enterprise Business Functions
  Business functions that have been released since the introduction of the new Enhancement Framework and Switch Framework. Here you'll find the business functions for HCM that have been released with EHPs 1 through 6.

Activated business functions are signified by the yellow light bulb icon; the Planned Status indicates that the business function will remain activated after being triggered, as shown in the example.

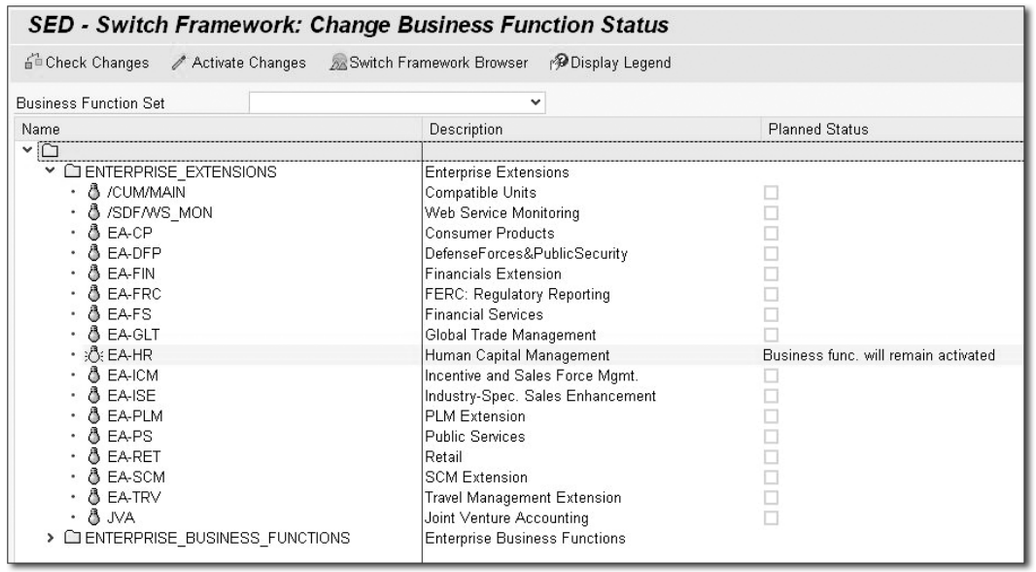

Figure 14.2 Switch Framework Customizing

14.2.3 Activating a Business Function

To activate a business function, follow these steps:

1. Read the associated documentation and release notes for the business function you intend to activate. The informational icons can be found in the business function details under the Documentation and Release Information columns, as shown in Figure 14.3. Click on an icon to view the related SAP Help information.
2. In the Dependencies column, there is an icon indicating either that required dependencies have been fulfilled or that there are dependencies that need to be addressed prior to activation. Click the icon to receive more detailed information.

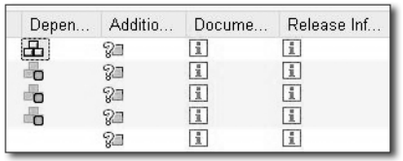

Figure 14.3 Business Function Dependencies and Release Information

3. Select the Planned Status checkbox of the desired business function.
4. Click the Check Changes button on the application toolbar. This validates that the necessary requirements have been fulfilled prior to activation. If predecessor business functions have not been activated, you'll receive an error message, as shown in Figure 14.4. Successful checks result in a confirmation that no errors were found.

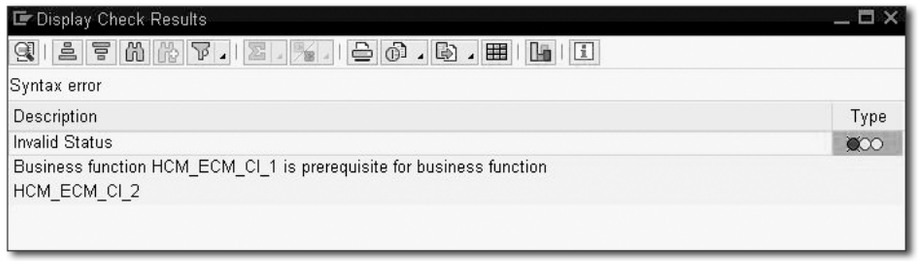

Figure 14.4 Display Check Results for Business Function

5. If the business function does not return any errors from the check process and you are ready for activation, you can click the Activate Changes button. This submits background job SFW_ACTIVATE_SFOX (see Figure 14.5) to generate the development objects, Data Dictionary elements, menu path options, and IMG activity updates associated with the business function.

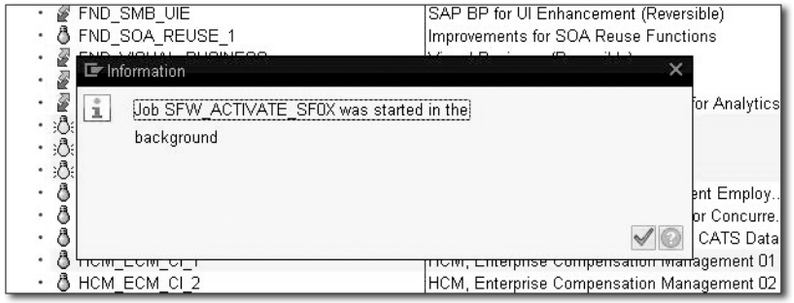

Figure 14.5 Business Function Background Job

6. Once the job has successfully completed, the business function should be activated, as signified by the yellow light bulb. The Activated on date and time are captured on the listing for future reference. To review the results of the background job, choose GoTo • Switch Framework Logs from the menu.

Now that the business function is activated, you should see new IMG activities added to the Implementation Guide, new security roles available for access to the applications, and additional items in the SAP Easy Access menu. Also, there should be new object entries in the ABAP repository for programs, Data Dictionary elements, and BAdI enhancements. Read through the documentation to become better acquainted with the objects of the business function. If the business functions have not been activated, check with your SAP administrator for access to a sandbox environment, where proper evaluation can be conducted.

Note

Additional transactions related to the Switch Framework can be found using the SAP menu under Tools • ABAP Workbench • Development • Switch Framework.

In the next section, we cover the SAP NetWeaver Business Client for HTML, which provides access to web-enabled applications without the need for SAP GUI. This is the preferred method for non-portal customers to deliver ESS and MSS functionality to the workforce.

14.3 SAP NetWeaver Business Client

Starting in 2003, the SAP Enterprise Portal was the main focus for delivery of ESS and MSS applications. Early versions of ESS and MSS employed the portal pages, worksets, roles, and iViews customary with portal design to distribute these services. However, in 2009 SAP introduced an alternative to the portal for customers who weren't inclined to install the Java-based portal. This solution was the *SAP NetWeaver Business Client,* which is both a desktop and browser-based frontend to the ERP system for executing SAP GUI transactions and Web Dynpro for ABAP applications.

SAP NetWeaver Business Client provides role-based access configured within SAP ERP using Transaction PFCG, the same method used to configure SAP GUI access for business users. It's positioned to eventually replace the existing SAP GUI, creating a more harmonized environment between ERP and web-based applications. Two versions of the SAP NetWeaver Business Client are available:

- SAP NetWeaver Business Client for Desktop
- SAP NetWeaver Business Client for HTML

Both have access to the backend ERP system, and the desktop version provides additional functionality not found in the HTML version. However, the HTML version is offered for the casual user, which is appropriately suitable for both managers and employees. Let's examine the desktop functionality briefly and then explore the browser version and its impact on ESS and MSS.

Note

The majority of screen captures found in this book employ the SAP Corbu theme found in SAP GUI version 7.30. This UI creates a seamless transition between SAP GUI and browser-based applications.

14.3.1 SAP NetWeaver Business Client for Desktop

The SAP NetWeaver Business Client (NWBC) for Desktop version has a web browser look and feel incorporating the SAP Corbu theme, with a logon pad similar to SAP GUI and advanced navigational features. As shown in Figure 14.6, the initial screen keeps track of frequently used and last-opened activities. The user can enter a transaction code in the command bar at the top or search for applications by name, making the business user more productive, as he can quickly locate the services he needs to access.

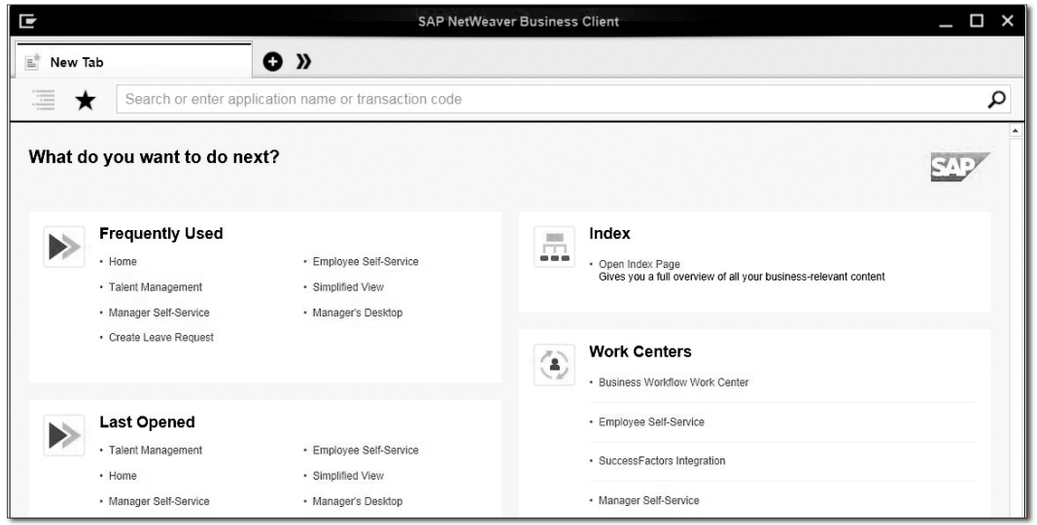

Figure 14.6 NWBC for Desktop

By clicking the INDEX selection, the user can see an overview list of all applications he is currently authorized to access based on his security role. The user can click on one of the WORK CENTERS, as shown in Figure 14.7, and see the menu items that are available for processing, similar to the SAP menu tree in the SAP GUI.

NWBC for Desktop is intended for power users and harmonizes applications between SAP GUI, Web Dynpro for ABAP, and SAP Enterprise Portal. Other UI applications can also be incorporated along with Personal Object Work Lists (POWLs), CHIP applications, and side-enabled applications delivered by SAP that extend the functionality of the basic SAP GUI transactions.

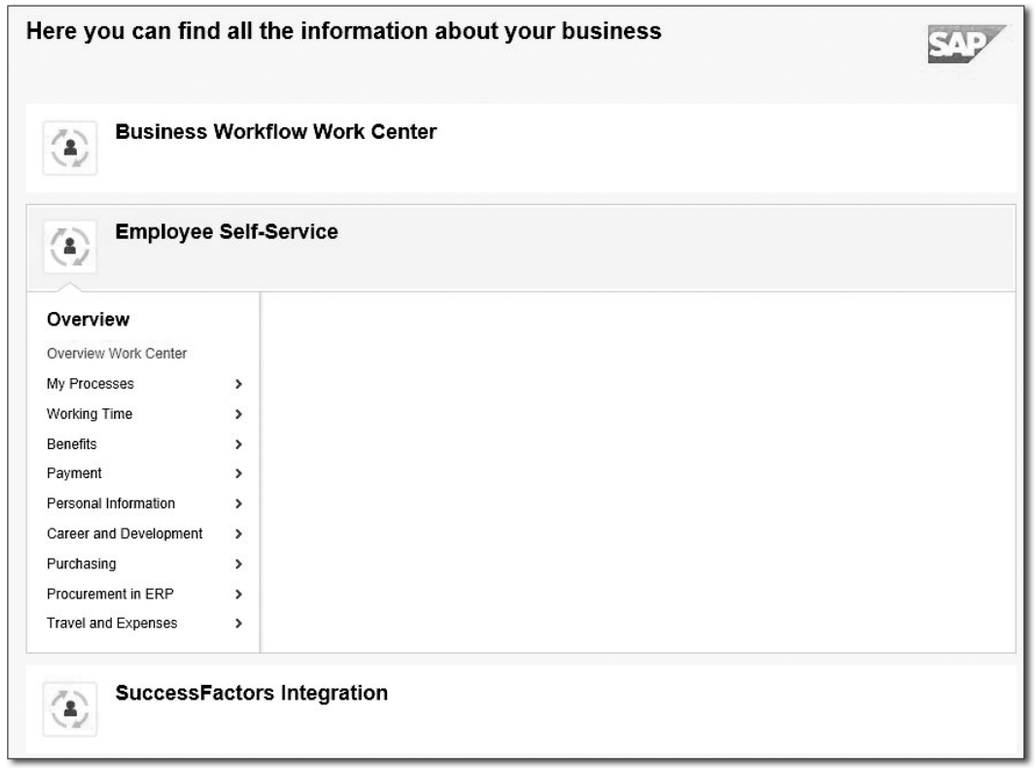

Figure 14.7 NWBC for Desktop Index Overview

Note

For more information related to side-enabled applications, CHIPs, SAPUI5, and other advancements using SAP NetWeaver Business Client, visit the SAP Community Network page at *http://scn.sap.com/community/netweaver-business-client*.

Since ESS and MSS applications target the more casual user, let's now consider NWBC for HTML, which requires no desktop software installation and can be rolled out to employees with minimal expense.

14.3.2 SAP NetWeaver Business Client for HTML

For non-portal customers, SAP NetWeaver Business Client for HTML provides a zero-footprint, browser-based client for casual users that requires no additional

software installation. This makes it an attractive choice for delivering ESS and MSS on Web Dynpro for ABAP technology. Both the desktop and HTML versions use the same URL address to call the service. For ESS and MSS applications, the URL link can be positioned on the corporate intranet portal.

Note

Business users can also initiate the NWBC for HTML client from their SAP GUI sessions using Transaction NWBC. You must be on at least EHP 3 to use the SAP GUI transaction.

The menu items available to HTML users are determined by their security roles. This allows a quick and easy configuration for the ESS landing page, as opposed to the configuration of the ESS Homepage Framework used within the SAP Enterprise Portal.

As we mentioned, NWBC for HTML is intended to allow casual users such as employees and managers to make occasional changes to their master data or to submit HR requests. In the next several sections, we discuss the ESS and MSS functionality offered through the NWBC for HTML client.

14.4 Employee Self-Service (WDA)

With EHP 5 for SAP ERP 6.0, SAP released *Employee Self-Service for Web Dynpro ABAP*, which allows customers to deploy all ESS applications using Web Dynpro for ABAP (WDA) technology. This removes the requirement of the SAP Enterprise Portal, as ESS applications can now be hosted from the NWBC for HTML. However, clients currently using the SAP Enterprise Portal are also able to incorporate the new WDA applications by implementing Business Package Employee Self-Service (WDA) 1.50.

Before you can use the new ESS (WDA) functionality, it must first be made available within the ERP system, as we show you in the next section.

14.4.1 ESS (WDA) Business Functions

The business functions associated with the new ESS (WDA) must be activated to install the included Web Dynpro for ABAP components, applications, dictionary elements, role authorizations, menu options, and IMG activities. Using Transaction SFW5, verify that the ESS (WDA) business functions have been installed and activated, as shown in Figure 14.8.

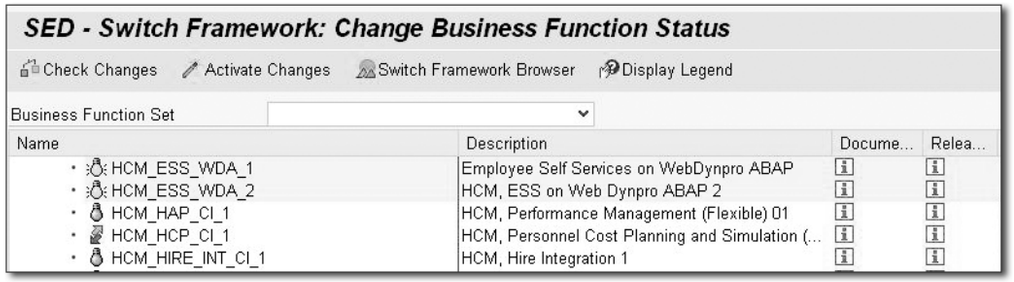

Figure 14.8 ESS (WDA) Business Functions

The business functions for ESS (WDA) are as follows:

- `HCM_ESS_WDA_1`
  Provides all ESS applications using Web Dynpro for ABAP technology. For more information regarding the included functionality, click the DOCUMENTATION button.
- `HCM_ESS_WDA_2`
  Delivered in EHP 6, this provides additional time management and benefits applications, the latest HCM Processes and Forms updates, security roles, and localized ESS applications for multiple country solutions. Prior to activation, the business function `HCM_ESS_WDA_1` must be previously activated. Click the DOCUMENTATION button or the RELEASE INFORMATION button for specifics regarding customizing ESS (WDA) and additional configuration and security information.

Note

For more information regarding the deployment of ESS (WDA), refer to SAP Note 1450179. This document describes the possible roll-out options for delivery of both Java and Web Dynpro ABAP-based applications for customers who currently use the SAP Enterprise Portal.

14.4.2 Employee Navigation

Early adopters of ESS using the SAP Enterprise Portal are familiar with a homepage framework where portal services are grouped within an area page. With SAP NetWeaver Business Client for HTML, the employee overview is now presented as a service map, thus eliminating the need for the ESS Homepage and reducing

the configuration effort typically required. The left side of the screen provides an application menu similar to the SAP EASY ACCESS menu. Using Transaction PFCG, the menu of services is incorporated with standard role menu configuration to present a landing page comparable to that shown in Figure 14.9. Employees will only see the ESS service links for which they have been provided security access or that have been configured for display based on their employment status or other Personnel Administration criteria.

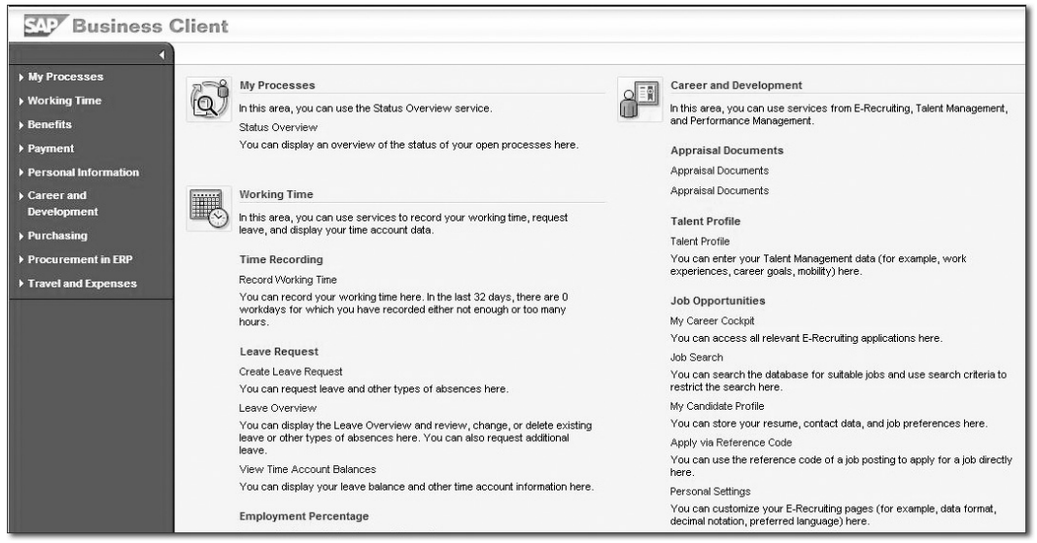

Figure 14.9 NWBC Landing Page for ESS

The services are launchpad-driven based on the configuration in Transaction LPD_CUST, which we discuss in more detail in Section 14.5.3. The SAP Enterprise Portal Homepage can be configured to support the new ESS (WDA) services as well as ESS (Java) services. The portal role can be found in Business Package Employee Self-Service (WDA) 1.50.

Employees call NWBC for HTML through a browser window provided as a link on the corporate intranet. They gain access through their assigned user ID on Infotype 0105 subtype 0001, which is given the ESS (WDA) role authorizations. The delivered roles are included in the business function, so let's examine them now in greater detail.

14.4.3 Authorizations for ESS (WDA)

To access ESS applications using NWBC for HTML, employees must be assigned a user ID for logging on to the ECC system. The user ID for the employee is stored on Infotype 0105, subtype 0001, and is assigned the roles associated with the ESS (WDA) services.

The following SAP roles can be assigned directly or copied to custom roles, configured to meet the services intended for employees, and assigned to the employee user ID:

- `SAP_EMPLOYEE_ESS_WDA_1`
  Installed with EHP 5, this role contains the overall services along with its ESS menu.
- `SAP_EMPLOYEE_ESS_WDA_2`
  With EHP 6, this role replaces the earlier EHP 5 role `SAP_EMPLOYEE_ESS_WDA_1` with additional services, including the addition of benefits functionality and localized services for multiple countries. The composite role contains various roles, as shown in Figure 14.10.

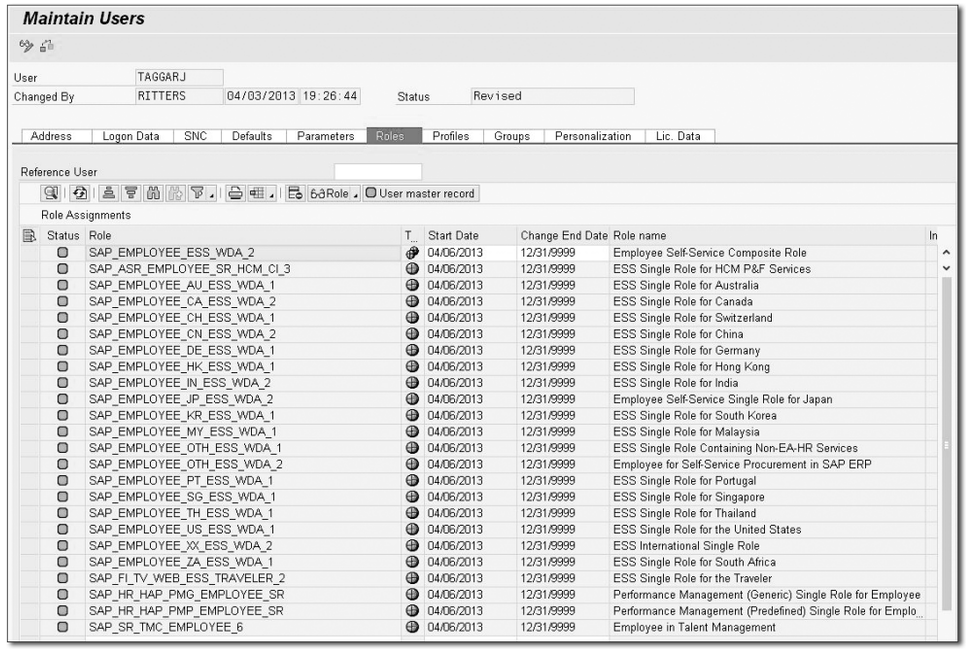

Figure 14.10 Composite Role SAP_EMPLOYEE_ESS_WDA_2

Services are filtered by the country grouping assigned to the employee through the application parameter `COUNTRYGROUPING`. Applications that employ this parameter will determine display and user access based on the user's country grouping assignment. When using a copy of the standard SAP-delivered role, however, you must add the new role name to the filter values for BAdI implementation `HRESS_NWBC_MENU_EXT` (see Figure 14.11).

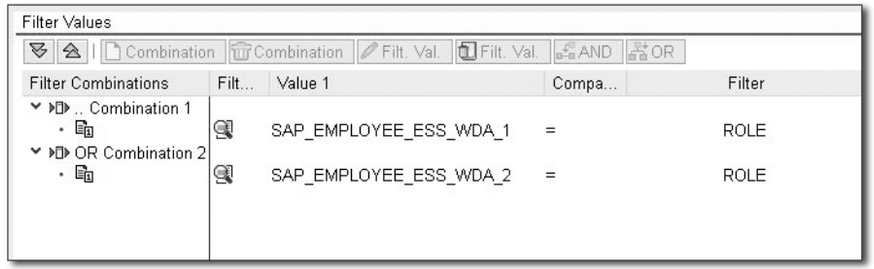

Figure 14.11 BAdI HRESS_NWBC_MENU_EXT Filter Values

We recommend that you copy the standard SAP role to a custom role. Using the custom role, you then grant services tailored to the applications identified by HR leadership for use by employees. With employees now having access to ESS (WDA), there are still some modifications and changes you may need to make to control the behavior of the product before final release. We now cover these customizing enhancements available to the technical team.

14.4.4 Customizing ESS (WDA) Applications

Once the ESS (WDA) business functions have been activated, new activities in the Implementation Guide will appear, allowing you to further customize the ESS (WDA) processes. You can find these activities under the IMG path Personnel Management • Employee Self-Service (Web Dynpro ABAP), as shown in Figure 14.12.

Of the customizations that can be performed, we discuss those listed under General Settings in the ESS (WDA) IMG path as well as some of the most useful enhancements provided.

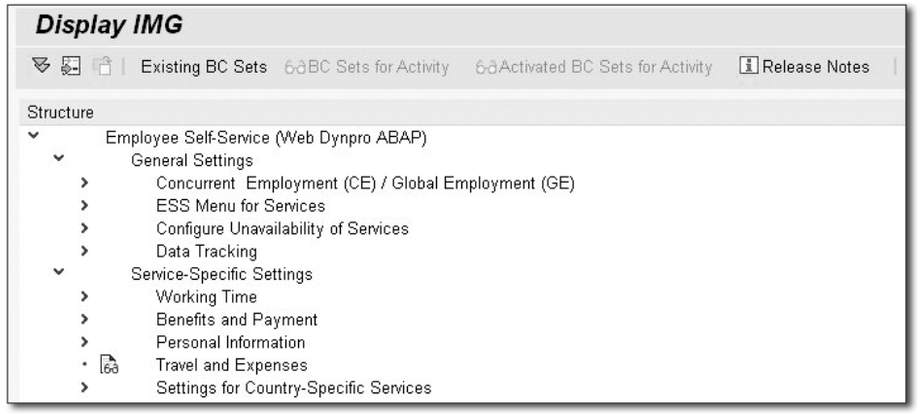

Figure 14.12 ESS (WDA) IMG Activities

Concurrent Employment (CE)/Global Employment (GE)

An employee who is concurrently enrolled in two or more positions within the organization must be able to choose the appropriate personnel assignment prior to modifying personal data or submitting a request. Using this IMG activity, you can activate Concurrent Employment (CE) and Global Employment (GE) for specific applications, such as Personal Information or Benefits Enrollment, by updating view `V_T7XSSCE_GRP` with the desired grouping reader class (e.g., `CL_HRXSSCE_PERNR_GRP_INFO`), as shown in Figure 14.13.

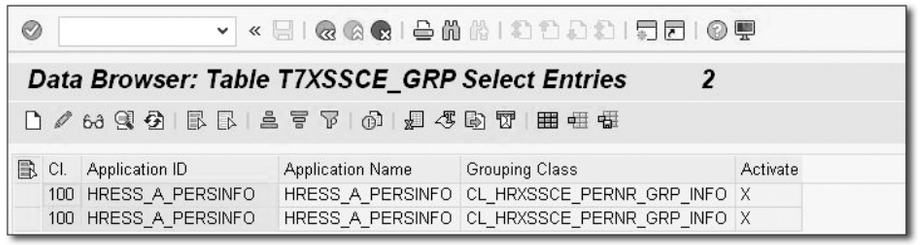

Figure 14.13 Table T7XSSCE_GRP

When activated, the system executes function module `RH_STRUC_GET` using evaluation path `US_CP_P` to determine the current personnel assignments for the employee. In accordance with this evaluation path, the user ID object `US` must be linked to object `CP`, which is then resolved to the related Person objects `P`.

ESS Menu for Services

Under this IMG activity, you can configure either the SAP Enterprise Portal for WDA applications or ESS (WDA) for NWBC for HTML. As discussed earlier, the configuration of the ESS (WDA) menu is based on the standard security role authorizations established in Transaction PFCG. Therefore, the applications included in the SAP menu of the security role determine the ESS applications available to the employee. This eliminates the SAP NetWeaver required IMG configuration step Homepage for Self-Services, simplifying the task of configuring the employee menu.

In addition to the security-configured menu, services can also be controlled from BAdI definition `HRESS_MENU`. Using this definition, you can hide/show, enable/disable, and alter text or description fields for a service. Under the IMG menu path Personnel Management • Employee Self-Service (Web Dynpro ABAP) • General Settings • ESS Menu For Services • Menu for SAP NetWeaver Business Client for HTML • BAdI: Specify Dynamic Rendering of Services, you can choose to create a BAdI implementation. The default BAdI implementation supplied by SAP is `HR_COUNTRY_FILTER`.

Configure Unavailability of Services

There are times when services should not be available to an employee based on his employment status or other personnel criteria. For this purpose, SAP supplies BAdI definition `HRXSS_SERVICE_FILTER` along with default implementation `EIMPL_HRXSS_SERVICE_FILTER`. Although the BAdI is delivered to filter by employment status, you can modify your own BAdI implementation to filter by other personnel criteria. The IMG activity can be found under Personnel Management • Employee Self-Service (Web Dynpro ABAP) • General Settings • Configure Unavailability of Services.

The logic found in the default implementation utilizes view `V_T7XSSCESTATFLT` to filter the services, as shown in Figure 14.14. The view requires the entry of the application path, application name, and service key, whereas the service key can be left blank intentionally. The entry of a grace period is permitted, extending the time for which an employee can access a page (see Figure 14.15).

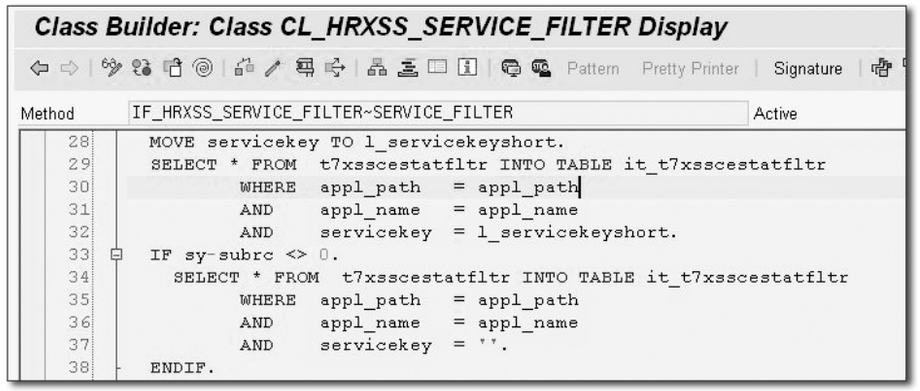

Figure 14.14 BAdI Implementation EIMPL_HRXSS_SERVICE_FILTER

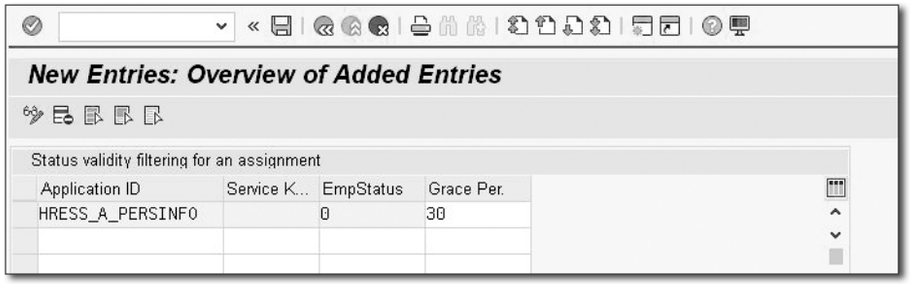

Figure 14.15 View V_T7XSSCESTATFLT

Data Tracking for Services

The final item under the General Settings section of the ESS (WDA) IMG menu is data tracking. For measuring the use of various ESS services, there are two configuration activities here for use with SAP BusinessObjects Business Intelligence (BI) and OLAP reporting. The first step allows you to activate data tracking for all ESS services as a single checkbox that must be selected. However, if you only want to track certain ESS applications, you can use the subsequent IMG activity, Set Data Tracking for Individual Self-Services, to selectively determine those services that should be recorded for BI reporting.

Service-Specific Settings

Besides the General Settings portion of the IMG for ESS (WDA), there are service-specific settings that allow you to customize the time, benefits, and personal data services as well as the country-specific localization services. Some of these remain the same for both the SAP Enterprise Portal applications and the Web Dynpro for ABAP-based applications. However, you should review the IMG activities specific to ESS (WDA) and the available BAdIs that are provided for further enhancement of the delivered services.

The ESS (WDA) applications can also be configured to meet business requirements as needed. In the next section, we discuss in detail the configuration of Web Dynpro for ABAP components and applications.

14.5 Manager Self-Service (WDA)

SAP released Manager Self-Service for Web Dynpro for ABAP for general availability in December 2011, six months after the release of EHP 5 for SAP ERP 6.0. Delivered separately from an enhancement package, the business function was labeled Manager Add-On 1.0 since it delivered MSS functionality based on Web Dynpro for ABAP technology.

As illustrated in Figure 14.16, the business function for MSS (WDA) is installed on an SAP ERP system and requires prior installation of EHP 5. Similar to the roll-out of ESS (WDA), SAP Enterprise Portal customers are able to assimilate the new MSS (WDA) applications into their existing portal configuration by also installing Business Package for SAP MSS Add-On 1.0.

Just like an enhancement package, MSS Add-On 1.0 provides a business function that must be activated through the Switch Framework, which we examine more closely in the next section.

Note

Prior to using the MSS (WDA) applications, the organizational structure of your company must be established in the Organizational Management (OM) component.

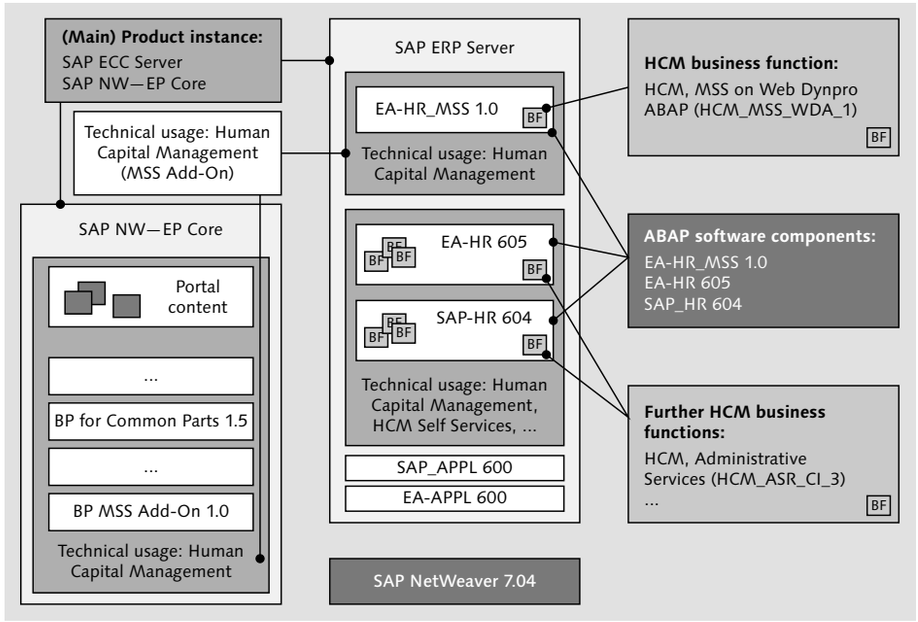

Figure 14.16 MSS Add-On 1.0 System Landscape

14.5.1 MSS (WDA) Business Function

The features provided with the business function Manager Add-On 1.0 include the following:

- SAP Manager Self-Service suite based entirely on Web Dynpro for ABAP technology, allowing for non-portal deployment of MSS services
- Business Package 1.50 for the SAP Enterprise Portal for incorporation of MSS (WDA) applications
- Employee Self-Service on Behalf of Employees, which enables managers to initiate ESS (WDA) processes from the Team Viewer application for subordinate employees
- Tighter integration between MSS and the Talent Management suite of applications, including Employee Performance Management, SAP E-Recruiting, Enterprise Learning Solution, and Enterprise Compensation Management
- Improved user interface (UI) and user experience (UX)

You activate business function `HCM_MSS_WDA_1` from Transaction SFW5 (Switch Framework Customizing). Using the transaction, you can verify whether Manager Add-On 1.0 has been installed and activated, as shown in Figure 14.17. If it's inactive, refer to Section 14.2.3 for more information regarding business function activation.

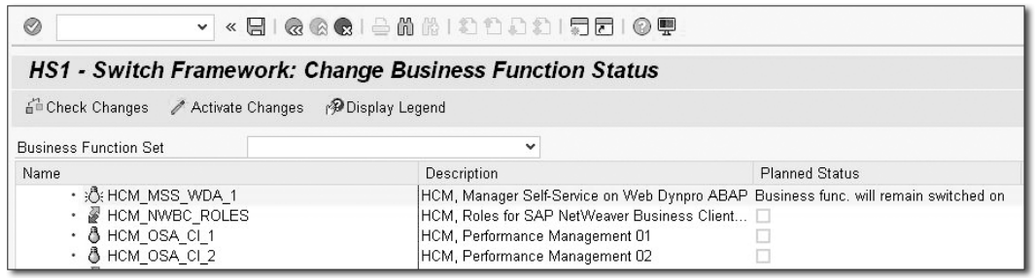

Figure 14.17 MSS (WDA) Business Function

You should always review the associated Documentation and Release Information before activation. As discussed in Section 14.2.2, this activity should be performed in a sandbox environment to avoid conflicts with existing business processes during the evaluation phase. Upon activation, the associated elements, such as menu path options, IMG activities, and development objects, will be available. This includes the MSS (WDA) role authorizations, which we discuss next.

14.5.2 Authorization for MSS (WDA)

Following activation, the included role authorization should be assigned to managers or supervisors within your organization via their SAP user ID. You can find the user ID for each manager on his Infotype 0105, subtype 0001. One role is provided: `SAP_MANAGER_MSS_NWBC_2`. This composite role provides a menu of all MSS-enabled applications. Of the single roles contained within, there are additional authorizations for Talent Management, SAP E-Recruiting, SAP Learning Solution, Time Approval, and HR Administrative Services, as shown in Figure 14.18. However, each of these applications may require the activation of their respective business functions, if available, before using the full MSS integration capabilities.

It is advisable to copy the composite role so the custom role can be modified to include only the supported services designated by HR leadership. Once the new

custom role has been assigned, the manager will have access to the MSS (WDA) application menu and the services that have been established for use.

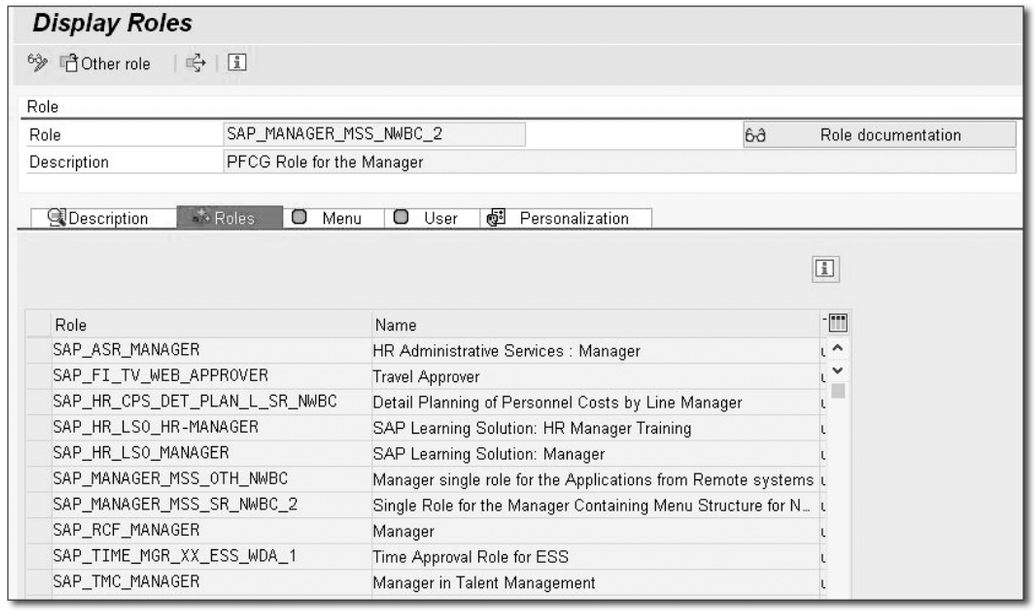

Figure 14.18 Composite Role SAP_MANAGER_MSS_NWBC_2

In the next section, we discuss how to navigate the service map and configure the organizational structures.

14.5.3 Manager Navigation

Managers access MSS (WDA) from NWBC for HTML using a link directed to the backend ERP system. This link is typically provided on a manager content page within the corporate intranet. The Internet Communication Manager (ICM) handles the incoming HTTP request and establishes the Internet connection to the system. We cover the ICM in more detail in Section 14.6.

After clicking the link, managers are prompted to log in with their SAP user ID, which has been assigned to their personnel number on Infotype 0105, subtype 0001. Once their personnel number has been determined, the system then

resolves their position within the organizational structure and the organizational unit they manage, which is based on the `A012` relationship in OM.

Once the manager's organizational unit has been established, the positions that belong to the organizational unit are retrieved, along with the employee information for personnel that currently hold those positions. The manager is then able to perform MSS functions for employees that report to him, as displayed in a structure established by the Object and Data Provider, which we examine more closely next.

Object and Data Provider

The *Object and Data Provider* (OADP) presents OM objects related to managers in a list or hierarchical tree where they can quickly retrieve additional information for a selected object or start an MSS functional process such as a personnel change request using HCM Processes and Forms. The use of OADP is available in both NWBC for HTML and SAP Enterprise Portal, where it was originally deployed prior to the use of Web Dynpro for ABAP applications.

You can view or edit the configuration of the OADP using the IMG menu path Personnel Management • Manager Self-Service (Web Dynpro ABAP) • Object and Data Provider.

The configurable components of the OADP consist of the following:

- **Object Provider**
  In this step, you determine the OM objects to be retrieved using evaluation paths for the desired objects and their relationships. This criterion is captured in the object rules for selection. For example, evaluation path `O-S-P` provides the positions reporting to an organizational unit and the employees that hold those positions, which are then displayed in a tree structure. The type of objects displayed can be employees, organizational units, cost centers, or other applicable objects. The defined object rules are combined to form the Object Selection.
- **Data Provider**
  For the objects that have been identified, you can configure additional information to be retrieved and displayed with the objects. This additional data is

stored in a column, the columns are assigned to a column group, and the column group is then tied to an object for display.

- **Organizational View**
  Configurations from the previous steps—that is, both objects and data—are joined together to form an organizational view. For example, a view can allow the manager to select his directly reporting employees, or it could provide all subordinate employees, regardless of organizational unit, that fall under the manager.

Once the organizational views have been established, they can be grouped together for a given application, where the manager can then determine how he wants to traverse the reporting structure. As shown in Figure 14.19, the organizational view grouping `MSS_TM_OVR_EEGP` consists of two possible selections the manager can use for navigation. You can even determine the order in which the views should appear in the dropdown box on the Team Viewer page using the Position field found in view `V_TWPC_ORGVWG_P`.

Figure 14.19 Organizational View Group MSS_TM_OVR_EEGP

When you are using OADP with Web Dynpro for ABAP applications, the configured values are entered in the parameters of the application when assigning authorizations under Transaction PFCG. When displaying the MSS (WDA) single role `SAP_MANAGER_MSS_SR_NWBC_2`, you can right-click the Web Dynpro application `HRMSS_HOMEPAGE` in the Role menu to see the default parameter settings. As shown in Figure 14.20, the application parameter `ORGVIEWGRP` has been assigned `MSS_TM_OVR_EEGP` for the organizational structure grouping.

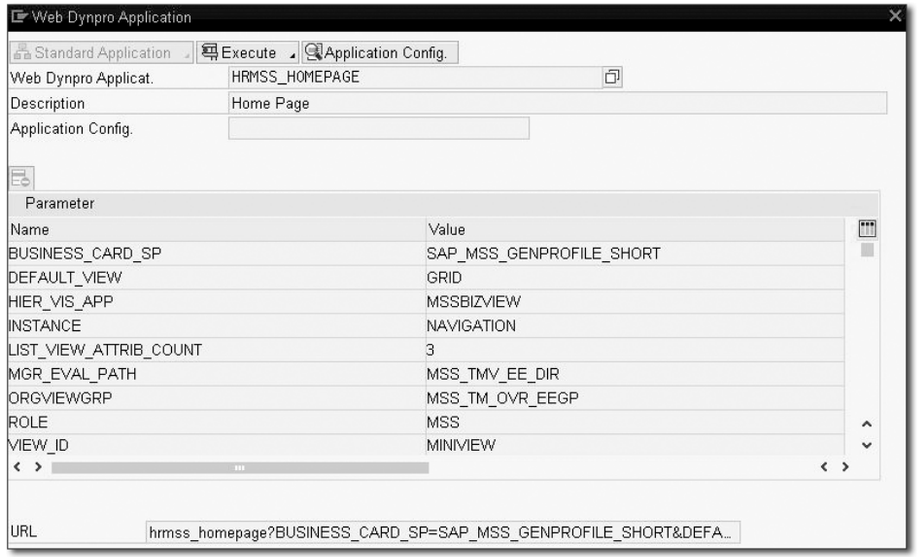

Figure 14.20 HRMSS_HOMEPAGE Parameters

For customers who employ ALE and have their OM information on a separate instance from the personnel data, SAP provides BAdI `XSS_DATAORIGIN` and method `GET_RFC_DESTINATION`. An RFC destination can be specified to retrieve the additional employee information to include with the OM objects of the central instance.

Application-to-Application Navigation

Upon displaying the objects and related information, the manager now requires the ability to select an object and perform a business process such as selecting a direct report and retrieving his employee profile. This action is performed using *application-to-application navigation*, of which there are two types:

- Web Dynpro for ABAP application
- Object-Based Navigation

Both of these call types are launchpad-defined, where they are configured from Transaction LPD_CUST. If you refer to Figure 14.20, you'll see the parameters ROLE and INSTANCE on the `HRMSS_HOMEPAGE` application. They contain the values

MSS and NAVIGATION, respectively. Now, let's perform the IMG activity Personnel Management • Manager Self-Service (Web Dynpro ABAP) • Object-Based Navigation • Adjust Object-Based Navigation for Manager Self-Service. The Overview of Launchpads screen is displayed, where you can select the role MSS and instance NAVIGATION from the list, as shown in Figure 14.21.

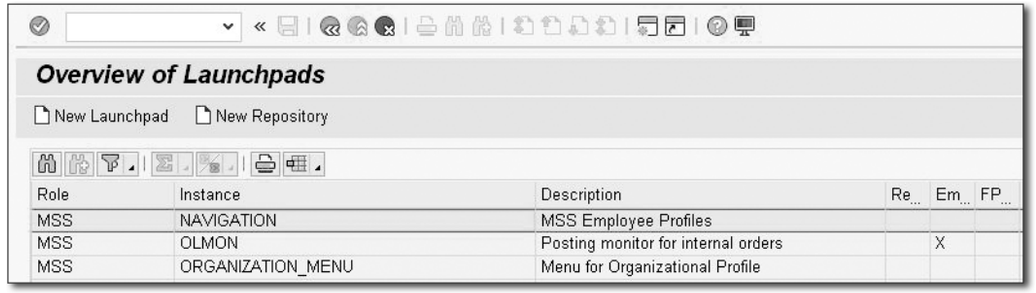

Figure 14.21 Overview of Launchpads (LPD_CUST)

Double-click the entry to display the list of applications that are available to the manager (see Figure 14.22). This list contains a mixture of Object-Based Navigation objects and Web Dynpro for ABAP applications. Object-Based Navigation entries represent business objects that can be found in the Business Object Repository, as we discussed in Chapter 10, while Web Dynpro for ABAP entries are tied directly to an application.

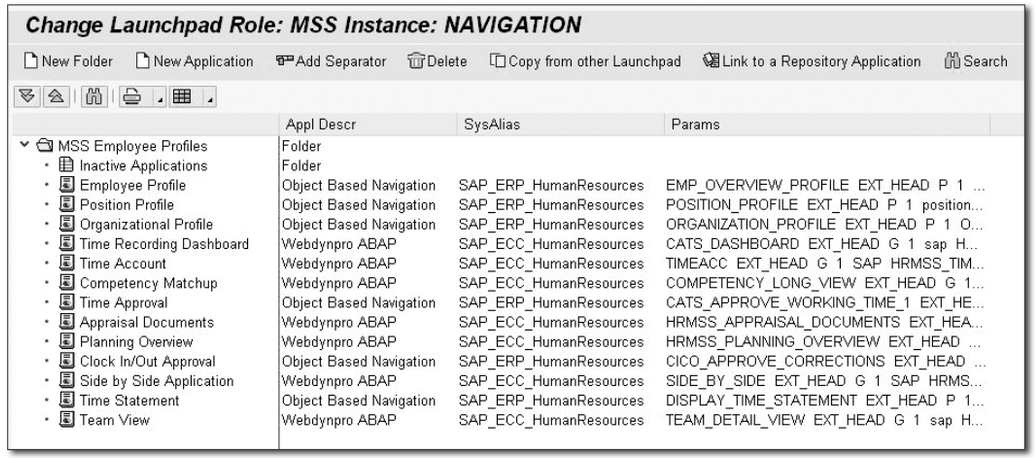

Figure 14.22 Launchpad Role MSS Instance NAVIGATION

Clicking on an entry with Webdynpro ABAP in the Appl. Descr. field shows the details on the far right side of the screen. As shown in Figure 14.23, the details for Side-by-Side Application are displayed.

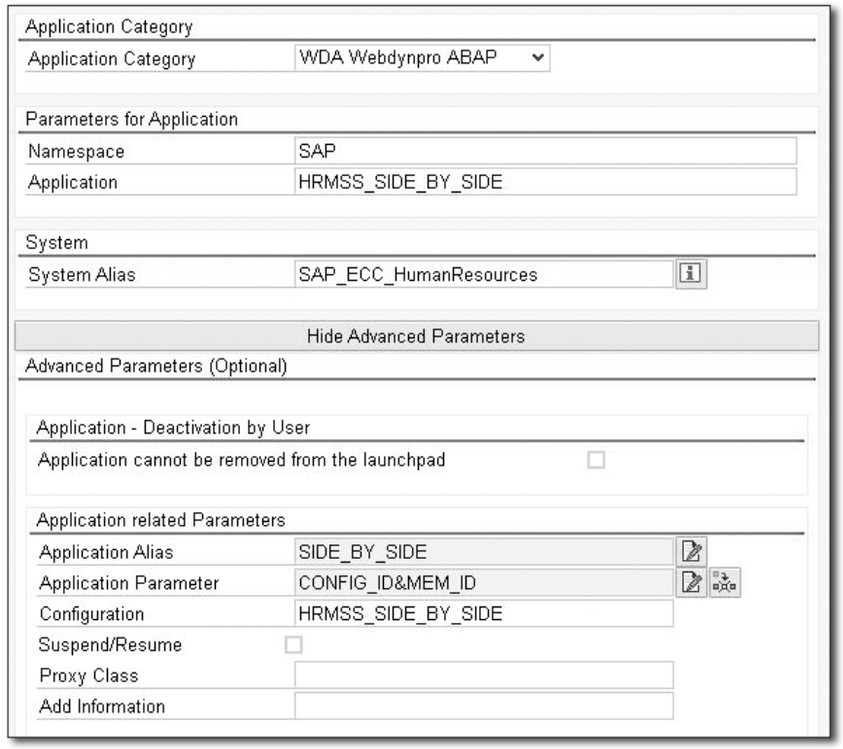

Figure 14.23 Side-By-Side Application Details

The Application Category shows the navigation type WDA.

Under the Parameters for Application section are the following fields:

- Namespace
  The namespace where the HTTP service reference resides in the Internet Communication Manager, which we cover in Section 14.6.1
- Application
  The Web Dynpro for ABAP application that is triggered upon selection from the Object-Based Navigation menu

Using the launchpad menu, managers can perform a mixture of Object-Based Navigation—driven applications. In addition to the applications, the menu can also be formatted to better organize and improve the layout appearance of the dropdown values on the MSS (WDA) page.

One additional item to note is the Configuration field under the section Application-related Parameters. Web Dynpro for ABAP applications can be configured to the needs of the customer by altering the functionality and appearance of the application, thus making any cosmetic or process changes that users might require. This makes enhancements to the standard product much easier to apply. In the next section, we examine the configuration of a Web Dynpro for ABAP application.

14.5.4 Configuring MSS (WDA) Applications

Often, SAP-delivered MSS (WDA) applications may not meet the requirements of business users. SAP has made it possible to configure Web Dynpro for ABAP components and applications and avoid the need to either modify the standard product or create a custom copy, which can result in missing out on important upgrades and enhancements.

In the next sections, we discuss the configuration concept and show you how to access the Web Dynpro for ABAP configurator.

Application Configuration

An application configuration of a Web Dynpro for ABAP program constitutes a behavioral change in the way the application performs. This is accomplished by changing the application parameters. For example, a parameter of the application may contain the display level of an organizational structure with the default value set to direct reports only. However, you may change the parameter value to show all employees.

Using the side-by-side application from the earlier section, let's look at an associated application configuration. Go to Transaction SE80 and choose the Repository Browser. Next, choose Web Dynpro Comp./Intf. and enter the Web Dynpro for ABAP component name `FPM_OIF_COMPONENT`. A list of objects will be displayed.

From this list, choose Web Dynpro Applications and find `HRMSS_SIDE_BY_SIDE`. Under this selection is the application configuration `HRMSS_SIDE_BY_SIDE`, as shown in Figure 14.24.

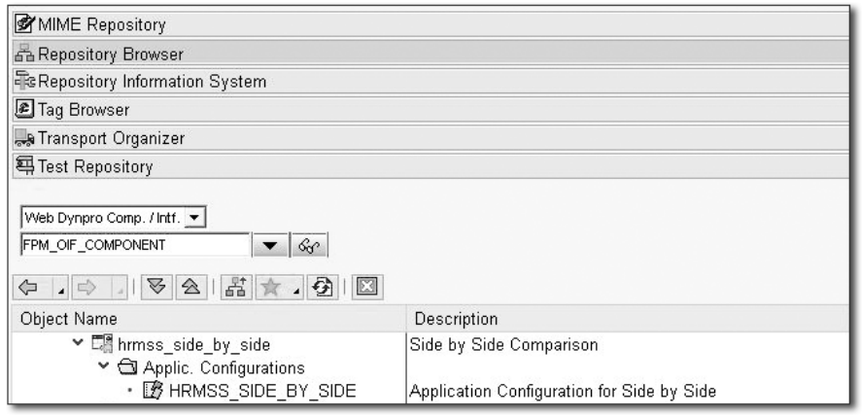

Figure 14.24 HRMSS_SIDE_BY_SIDE Application Configuration

Double-click the `HRMSS_SIDE_BY_SIDE` application configuration to see the Attributes screen. At the bottom of this screen, click the Start Configurator button, as shown in Figure 14.25. This triggers the Web Dynpro for ABAP Application Configuration Editor (see Figure 14.26).

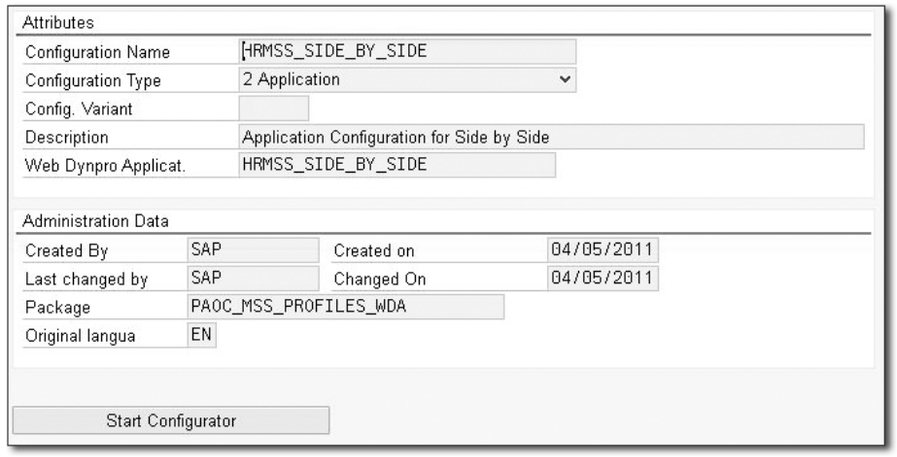

Figure 14.25 HRMSS_SIDE_BY_SIDE Attributes

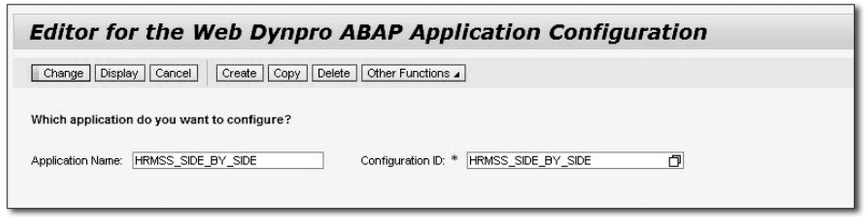

Figure 14.26 Application Configuration Editor

From the Configuration Editor, click the DISPLAY button and then choose the APPLICATION PARAMETERS tab, as shown in Figure 14.27. A parameter list is displayed, but this particular Configuration ID cannot be changed without an access key from SAP. If you want to create your own configuration, you must return to the initial screen and copy configuration ID `HRMSS_SIDE_BY_SIDE` to a custom selection that falls within the customer namespace. From there, you can then modify the parameters as necessary for the organization and save your settings. This application configuration can now be used for assignment to a role authorization menu.

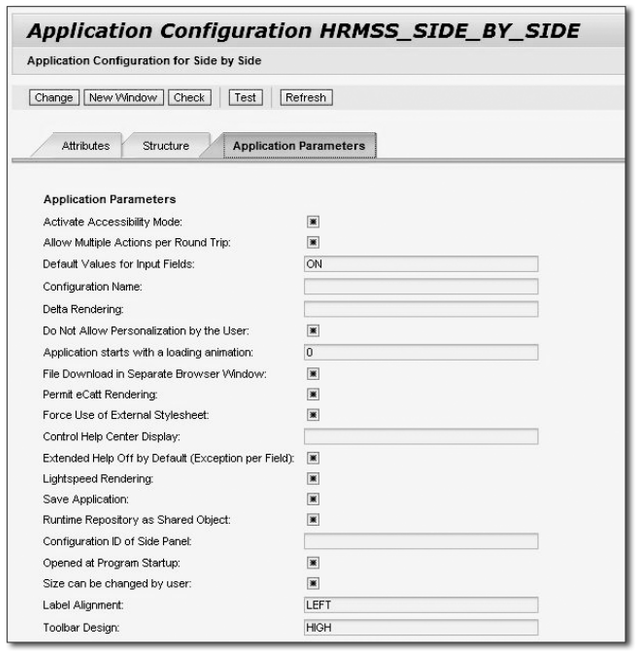

Figure 14.27 HRMSS_SIDE_BY_SIDE Application Parameters

In the next section, we continue with this application and show you how to visually modify and extend the application using component configuration.

Component Configuration

Using our current example, click the STRUCTURE tab. The next screen shows you the component usage for the `FPM_OIF_COMPONENT` component (see Figure 14.28). Click the GO TO COMPONENT CONFIGURATION button.

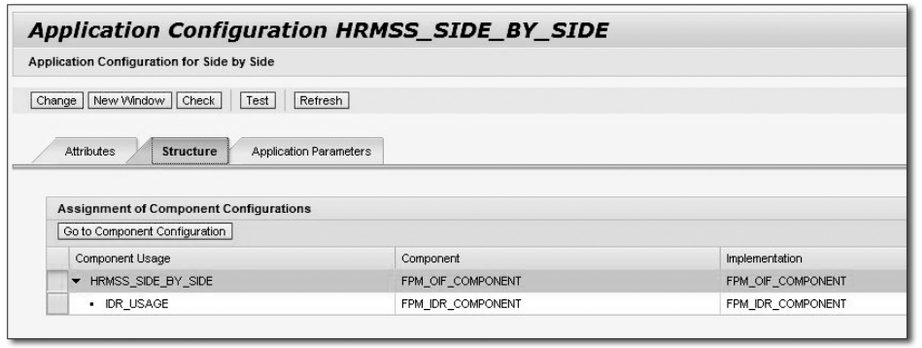

Figure 14.28 Application Configuration Structure

The component configuration `HRMSS_SIDE_BY_SIDE_OIF`, as shown in Figure 14.29, allows you to modify the appearance of the application and add additional elements to the standard SAP view. Also, you can use User Interface Building Blocks (UIBBs) to add other application-specific views to the current application, thereby extending process functionality.

The component `FPM_OIF_COMPONENT` that this application is based on and the UIBB concept belong to the *SAP Floorplan Manager* (FPM) framework. SAP has standardized the development of both SAP-delivered components and custom Web Dynpro for ABAP applications, providing a guideline for navigation, processing, and messaging.

For a more detailed discussion on SAP Floorplan Manager and HCM Processes and Forms using FPM, refer to Chapter 15.

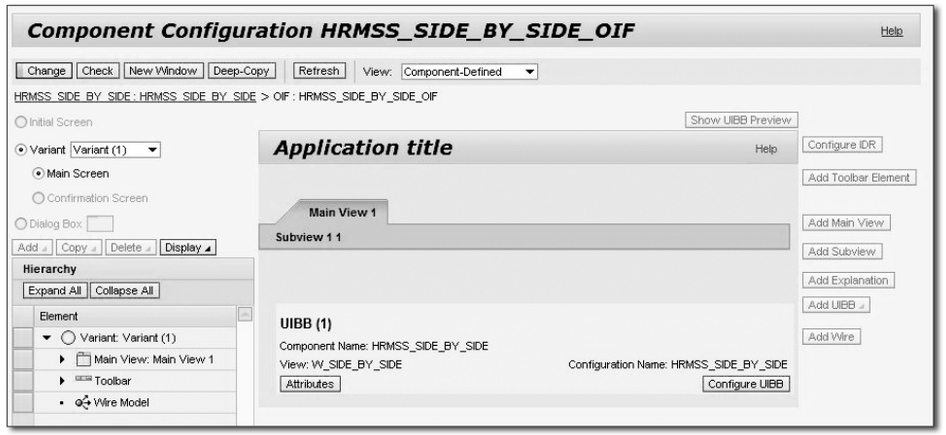

Figure 14.29 Component Configuration Editor

14.5.5 Customizing MSS (WDA) Applications

New activities in the Implementation Guide will appear after the MSS (WDA) business function has been activated in the system. Additional customization activities are located under the IMG menu path Personnel Management • Manager Self-Service (Web Dynpro ABAP). The following are some of the more relevant activities you will encounter when implementing MSS (WDA).

Organizational Chart Visualization

An alternative organizational chart can be displayed using the Organizational Chart Visualization application, which improves the user experience for managers when they're working with their organizational structures. It can be incorporated with the following services:

- Team View
- Change Position Details
- Start Process for Employee
- Start Process for Multiple Employees
- Start Organizational Process

The launchpad functionality configured in Transaction LPD_CUST works with the graphical layout to trigger applications, and the organizational structure is

retrieved using the OADP functionality. The IMG activity can be found under Personnel Management • Manager Self-Service (Web Dynpro ABAP) • Organizational Chart Visualization • Configure Organizational Chart Visualization. As shown in Figure 14.30, there are four steps to be performed in order:

1. Check Standard Organizational Chart Configuration: Review the standard configuration SAP provides. If any change is required, perform the following three steps. Otherwise, you can use the delivered configuration.
2. Transfer Standard Organizational Configuration: If you want to change the SAP configuration, this step copies the configuration from a cross-client table to the client-dependent Transferred Organizational Chart Configuration table, where you can make modifications.
3. Import Data from Object and Data Provider Configuration: If you would rather use the existing OADP configuration that you've deployed, you can copy this configuration to the Transferred Organizational Chart table for use in the final step.
4. Maintain Transferred Organizational Chart Configuration: In this step, you can modify the Transferred Organizational Chart Configuration that was either copied from the SAP standard or converted from your existing OADP configuration.

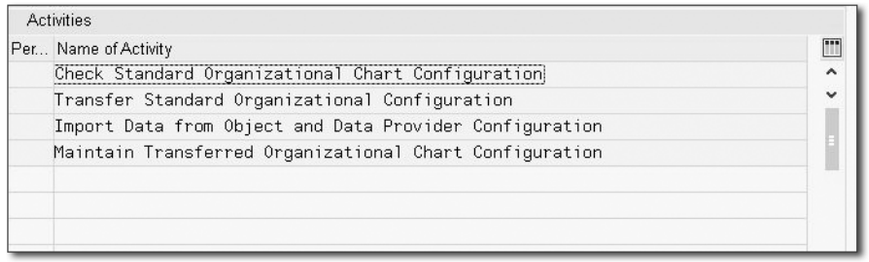

Figure 14.30 Configure Organizational Chart Visualization

Note

Implementing the Adobe Flash Island Embedded Organizational Chart requires activating business function `HCM_PD_UI_1` and installing add-on `EMBORGCH 605`. Further instructions can be found in SAP Note 1485853.

Data Tracking

Similar to the same step in ESS (WDA), you can enable data tracking for all services or choose the services to be tracked. This information is then used in the OLAP reporting functionality of SAP BusinessObjects BI.

The activity is located under the IMG menu path Personnel Management • Manager Self-Service (Web Dynpro ABAP) • Data Tracking.

Profile Applications

The Profile Applications section configures the short profile associated with the OADP organizational structure objects. There are a number of different profile applications used in the various organizational display formats, such as Organizational Profile, Position Profile, Team View (see Figure 14.31), and Compensation Profile. Field groups are set up to include the additional data fields required for the profile information.

Config. ID: SAP_MSS_TEAMVIEW — MSS: Short Profile for Team View and Comparison View

Add Fields to a Configuration

Field Name	Field Description	S...	Standard Field Label	Field Label
SAP_PA_PERNR	Personnel Number	1	Personnel number	Personnel Number
SAP_PA_OFFICE_NUMBER	Office Number	2	Office Number	Office Number
SAP_PA_MOBILE_NUMBER	Cell Phone Number	3	Mobile Number	Cell Phone Number
SAP_PA_EMAIL	E-Mail	4	E-Mail	E-Mail
SAP_PA_ORGANIZATIONAL_UNIT	Organizational Unit	5	Organizational Unit	Organizational Unit
SAP_PA_POSITION_NAME	Position	6	Position	Position
SAP_PA_CAPACITY_UTILIZATION	Capacity Utilization Level	7	Capacity Utilization Level (%)	Capacity Utilization Level (%)
SAP_TALENT_GROUP	Talent Group	8	Talent Group	Talent Group
SAP_ECM_POTENTIAL	Potential	9	Potential	Potential
SAP_ECM_PERFORMANCE	Performance	10	Performance	Accomplishment
SAP_SUCCESSION	Succession	11	Successor For ...	Successor For ...
SAP_JOB_FAMILY	Job Family	12	Job Family	Job Family
SAP_RISK	Risk	13		Risk
SAP_ECM_SALARY	Salary	14	Salary	Salary
SAP_MSS_TOTAL_COMPENSATION	Total Compensation	15	Total Compensation	Total Compensation
SAP_ECM_COMPA_RATIO	Compa-Ratio	16	Compa-Ratio	Compa-Ratio

Figure 14.31 Team View Profile Layout

Included in this step is the setup of the employee profile photo associated with the Talent Management suite of applications, which can be displayed in different sizes according to the parameter group and parameter name.

The IMG path for this activity is Personnel Management • Manager Self-Service (Web Dynpro ABAP) • Profile Applications.

We recommend that you review the IMG activities remaining and determine the services you intend to provide. A number of BAdI enhancements are available to control the data retrieval and information display associated with the MSS (WDA) applications.

14.6 Internet Communication Manager

The Internet Communication Manager (ICM) handles the HTTP, HTTPS, and SMTP connections and requests between the SAP ECC system and the Internet/intranet. The SAP NetWeaver Business Client for HTML communicates with the SAP ECC system and SAP Web Application Server using this component. In earlier chapters, we discussed the services that are available within ESS (WDA) and MSS (WDA) and how they are called from an Internet browser.

In this section, we show you where to locate services, activate a service for use, and modify its settings.

14.6.1 Activating HTTP Services

There will be times when you call a service and receive a message with code 403 and reason Forbidden, as shown in Figure 14.32.

Service cannot be reached

What has happened?

Note

- The termination occurred in system HS1 with error code **403** and for the reason **Forbidden.**
- The selected virtual host was 0 .

What can I do?

- Please select a valid URL.
- If it is a valid URL, check whether service /sap/bc/webdynpro/sap/fitv_powl_approver is active in transaction SICF.
- If you do not yet have a user ID, contact your system administrator.

HTTP 403 - Forbidden
Your SAP Internet Communication Framework Team

Figure 14.32 Check Service is Active in SICF

As the second bullet point in Figure 14.32 suggests, you should use Transaction SICF (Maintain Services) to check that the service is currently active. Also, it's important to capture the directory path that is shown in the message so you can use it to search for the service.

Upon calling the transaction, click the EXECUTE button to be taken to the complete list of services. Using the path from the error message, navigate the tree structure until you locate the service in question (see Figure 14.33). You will notice that the service in question, FITV_POWL_APPROVER, is currently grayed out, signifying that it is inactive.

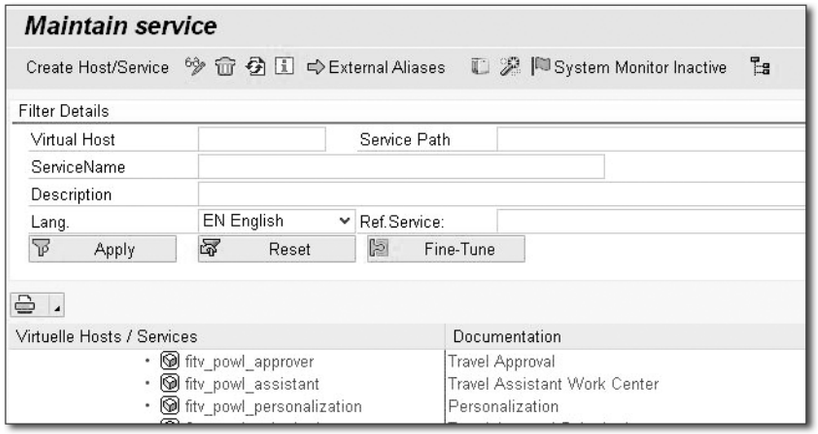

Figure 14.33 Service FITV_POWL_APPROVER

Right-click the service and a menu pops up. One of the selections in this list is ACTIVATE SERVICE. Choose this option to see the dialog box shown in Figure 14.34. There are two YES buttons: the first button activates only this service, and the second activates this portion of the directory path and all services that fall within the path folder. For this example, click the first YES button to continue.

Figure 14.34 Activation of ICF Service

The service now appears in black lettering, signifying that it's active and can be called remotely from a browser session. You can test it from here by right-clicking and choosing TEST SERVICE from the pop-up menu.

The service application should now function as intended (see Figure 14.35).

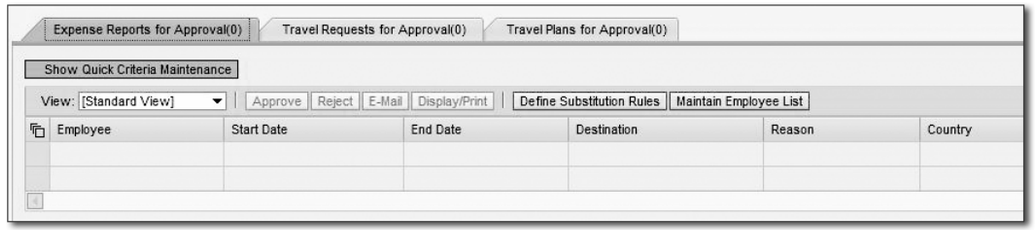

Figure 14.35 Travel Approval Service

14.6.2 Create/Change a Service

To create or change the settings of a service, right-click the service name and choose DISPLAY SERVICE. As shown in Figure 14.36, you'll see the SERVICE DATA displayed. Click the CHANGE button (eyeglasses/pen icon) on the application toolbar to enter change mode.

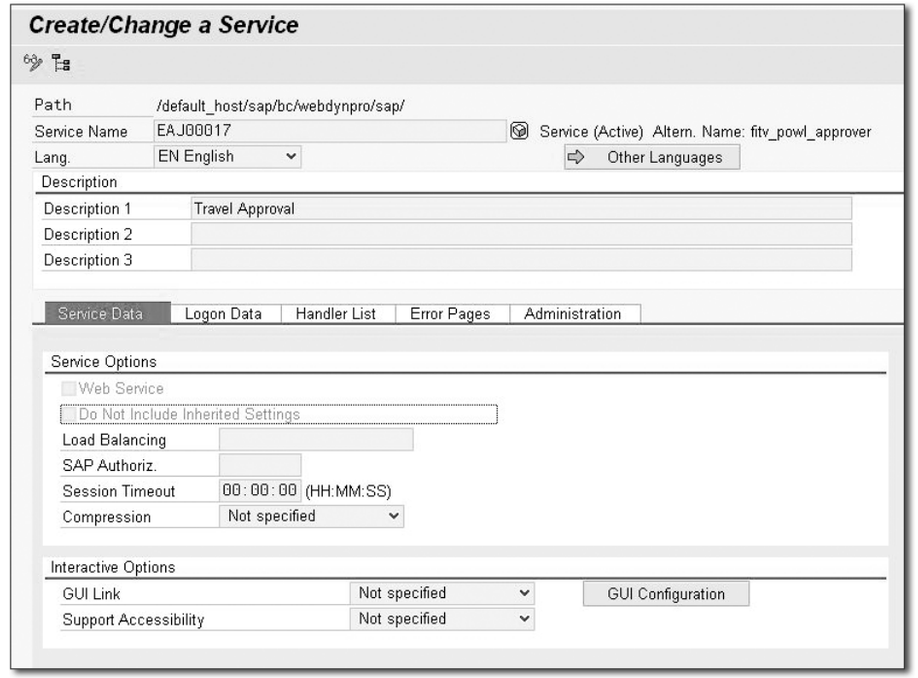

Figure 14.36 Create/Change a Service

Now, click the Error Pages tab. On this page, you'll see another set of tabs, so choose the Logon Errors tab (see Figure 14.37). Here you can create an explicit response, for example, stating that the service is currently unavailable or under construction, redirect to a different URL, or configure the system logon screen.

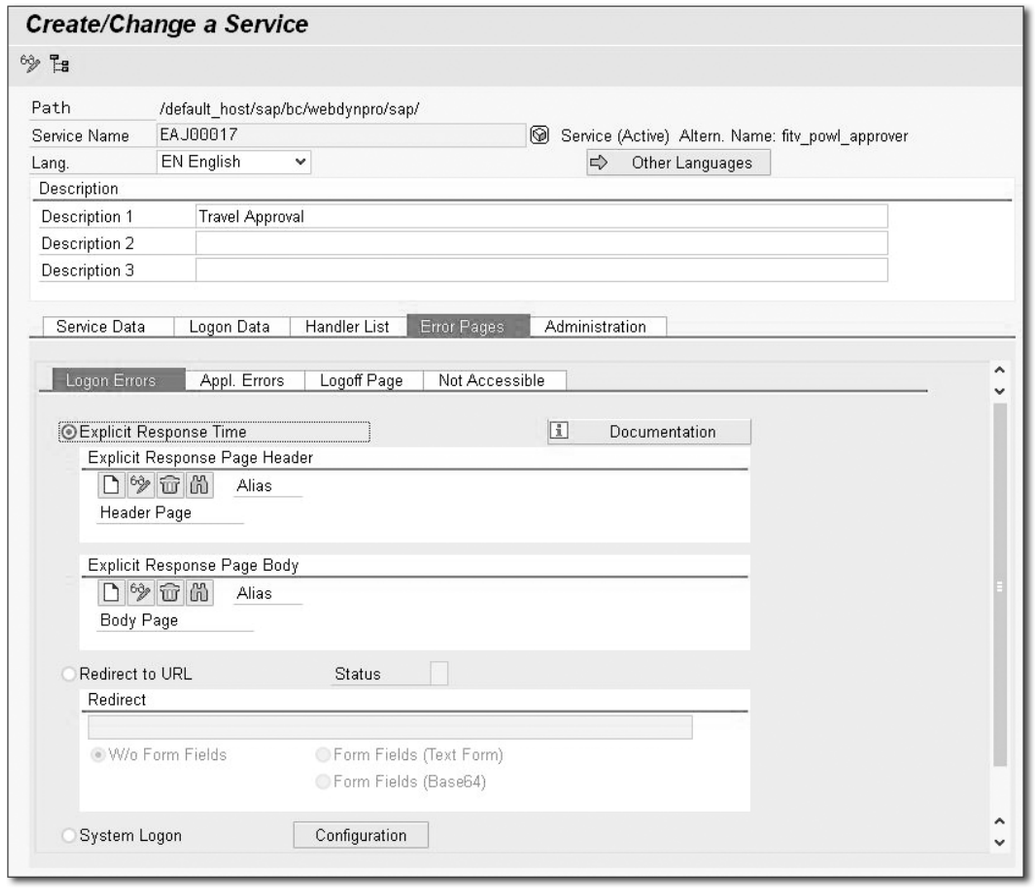

Figure 14.37 Logon Errors for Service

To configure the logon screen for this service, select the System Logon radio button at the bottom of the screen and then click the Configuration button next to it. You'll see a dialog box, as shown in Figure 14.38, which allows you to override the global logon settings. Now you can tailor the login screen as required to default the client, set the Internet protocol, specify fields in the Select Display section, and activate the check for multiple logon sessions. For example, you could

default the client field and then hide it so the user is not required to enter it during login. After all changes are made, save your settings and return. However, you should consult with system administrators before deviating from the logon global settings for Web Dynpro for ABAP applications.

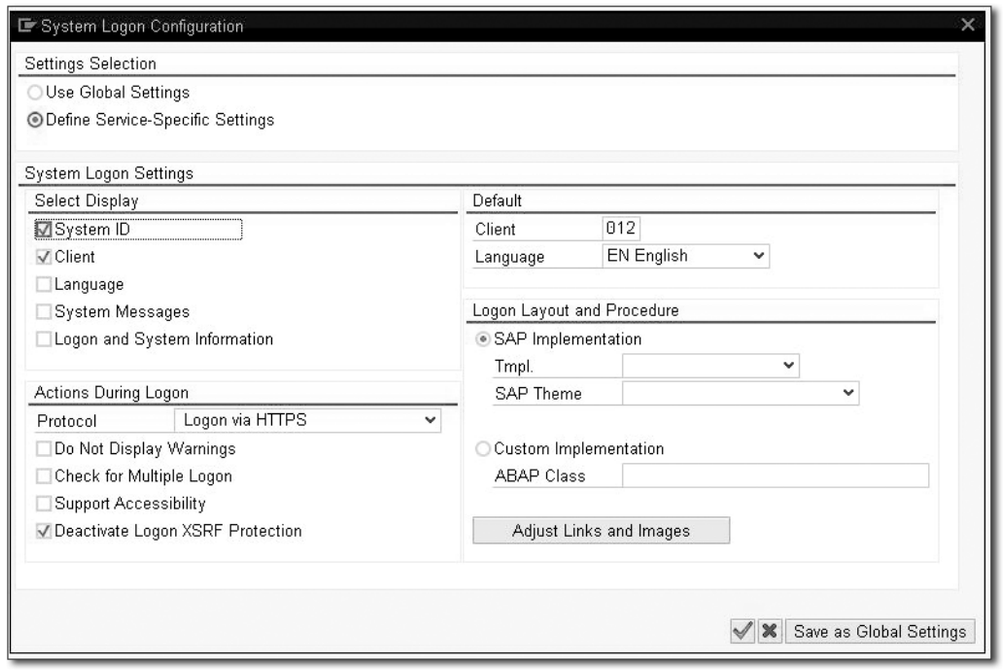

Figure 14.38 System Logon Configuration Override

14.7 SAP Fiori UX

With competitor applications providing increased access, enterprise-grade applications, and more simplified user interfaces, SAP has responded by investing in a new UI architecture, based on HTML5 and CSS3, to improve the user experience, or "UX," of their self-service software offerings. As a result, they introduced a new suite of mobile applications, which have a simplified, consistent design layout and lessened the burden of understanding underlying data infrastructures.

SAP Fiori UX is an evolutionary step in providing a simpler, more inviting user experience when accessing SAP enterprise services. To this point, we've covered the SAP technologies available in delivering self-service applications to the

desktop. However, in today's world, employees have the ability to consume enterprise applications "anytime, anywhere" when they are made readily available. With users being more "on the go" and not always having access to desktop hardware, SAP Fiori empowers them to quickly and easily make changes to their personal data or perform job-related tasks As a result, workforce productivity increases with the timeliness of system updates and improves the efficiency of workflow activities. Plus, the reduced cost in continued support and maintenance of mobility devices far outweighs a traditional hardware landscape.

In this section, we'll discuss the development methodology behind SAP Fiori applications, their reliance on both traditional and modern software design principles, and how they are delivered, whether through an on premise system or via the SAP HANA Cloud Platform.

First, let's gain an understanding of the design concepts and principles that comprise SAP Fiori applications.

Note

Fiori is the Italian word for "flowers," and it fits with SAP's desire for the new applications to bring delight to the end user. This coincides with one of the design principles discussed in the next section.

14.7.1 SAP Fiori Design Concept

SAP Fiori applications are based on a *use case* design principle that has been around for over 20 years. A use case is defined as an actor, or agent, and the list of steps, or tasks, that the agent must perform to affect a desired result within a system. Thus, each SAP Fiori application is built upon this construct of one agent accomplishing a single task. This simplifies processes, breaking them down into manageable tasks, and allows the developer to design a more coherent and concise solution.

Such a design philosophy was not representative of the majority of early enterprise applications that attempted to address multiple functions that had become overly cluttered with options and confusing to the intended user. This would lead to frustration in identifying the necessary functionality involved in the task at hand.

Usually, the user must execute separate transactions and then later combine the results in a third application, such as a spreadsheet, to achieve the desired end result. Also, multiple screens must be engaged to complete a single task. For

example, if a payroll analyst needs to update an employee's tax information prior to payroll processing, they typically use Transaction PA30 (Maintain Employee Master Data) and update the requisite infotype screens. However, this requires the analyst to have an understanding of the underlying tables that comprise the overall picture of the employee's tax withholding, that is, Infotype 0207 for Residence Tax Area, Infotype 0208 for Work Tax Area, Infotype 0209 for Unemployment State, Infotype 0210 for W4/W5 Withholding, and possibly Infotype 0234 for Additional Withholding U.S. There are multiple tax infotypes that must be updated, and the user is required to know how to navigate to each and update them accordingly.

Now, contrast that with an SAP Fiori application, bringing all elements of employee tax withholding together in one simple interface without requiring knowledge of the tax infotype technical architecture. This approach would greatly improve the experience for the analysts, allowing them to perform the task with a single user interface.

In designing the layout of the SAP Fiori applications, SAP developers have emphasized the following five design principles:

- **Role-based**
  Applications should concentrate on assisting an agent of the company in accomplishing a singular task for which he is responsible. For example, when an employee requests a leave, the manager is required to approve the leave request. Therefore, managers with direct reports should have the SAP Fiori Leave Request application, discussed later in this section, added to their homepage, where they can select that particular activity. SAP recommends a 1:1 relationship between an SAP Fiori application and a security role.

Tip

It's important that a developer truly listens to the needs of the user community and wholly understands the task from the users' perspective. Too often, the developer will focus on the technology first and not grasp the end users' vision of how they see the process being carried out. By listening and asking questions, a developer can make the design process more of a collaborative effort and, very often, arrive at a more cogent solution than either the user or the developer had first imagined.

- **Responsive**
  When performing a task, the users want the software to perform consistently regardless of the medium they may be using at the time. Also, they want the

application to recognize their role and adapt to their position and responsibilities. This may vary from user to user depending on their job responsibilities, to which the application should respond accordingly.

- **Simple**
  With the various mobility devices accessing the application, screen space can be limited, so it's important that the design is simple. The SAP Fiori application should adapt, as mentioned in the previous principle, and it should also avoid cluttering the UI with extraneous controls that are not required for a particular user. One of the reasons Apple has done so well with its consumer electronics is the simplicity of the design and the user interface. End users are looking for that same experience in their interactions with enterprise software. Make the interface intuitive, with obvious screen controls, and keep the user apprised of what is occurring as he moves through the process.
- **Coherent**
  In our earlier example, we mentioned how an analyst may need an understanding of HR infotypes and the technical specifics of the transaction. With SAP Fiori applications, we want to remove that requirement and let the user perform the task without burdening him with the nature of the backend system. Also, applications from various functional areas should behave the same and have a consistent look and feel, contributing to their intuitive nature; for example, an FI application should display the same screen controls as an HR application with the same design layouts.
- **Delightful**
  This can be one of the most important aspects of any application—make the user want to return to use the service again and again. There is nothing more discouraging than software that behaves unpredictably, returns vague and uninformative messaging, and fails to perform its necessary function. As a developer, you should make the process enjoyable and satisfying so the user will come back to it often.

Now that we've discussed the concept of how the applications should be designed and developed, let's take a closer look at how they appear and are delivered to our user community.

14.7.2 SAP Fiori Homepage

The *SAP Fiori homepage* consists of application tiles that are assigned to the user according to his role. A manager would see the leave request application on his

homepage, as shown in Figure 14.39, along with other applications assigned to the SAP Fiori manager role. Regardless of the device used, the application tiles adjust to the device's format.

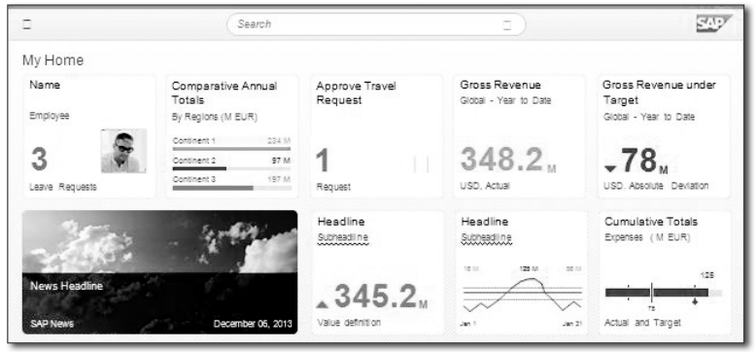

Figure 14.39 SAP Fiori Homepage (Desktop)

In Figure 14.40, you can see how the homepage adjusts to a mobile device presentation. In addition, the user can configure his homepage according to his preferences, by simply adding, removing, or rearranging the tiles as he wishes.

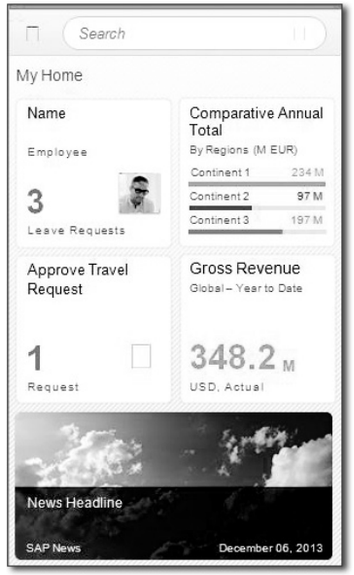

Figure 14.40 SAP Fiori Homepage (Smartphone)

In addition to the layout of the applications, the *shell bar* located at the top of the homepage provides users with the ability to return to the homepage while in an application, to access group panels for further navigation, to search for business objects and other applications, and to incorporate unique themes and corporate branding.

Note

To access SAP Fiori applications, the browser must be HTML5-compatible.

The homepage layout is controlled through the Launchpad Designer and Transaction LPD_CUST. This is the same transaction we covered earlier in this chapter for the layout of the MSS Web Dynpro ABAP applications. The backend SAP Business Suite controls the SAP Fiori applications that the user is capable of viewing and is coordinated through standard SAP security roles and menus.

Next, we'll provide you with an overview of the types of applications that can be distributed to users through the homepage, and how to choose the right type of SAP Fiori design layout for your particular application.

14.7.3 SAP Fiori Application Types

When you design an SAP Fiori application, there are uniquely defined application types that provide users with either real-time information, access to navigated task processes, or analytical information. Each type of application requires a specific deployment for the desired end result and has specific requirements related to the backend system and the underlying database. For instance, when delivering analytical data and performing high-volume calculations, the SAP HANA database is required for the backend system in order to present the data in a timely and efficient manner.

The three SAP Fiori application types are as follows:

- **Transactional**
  This is the use case, task-based application with guided navigation and a clear, concise goal in mind. Transactional applications can perform such tasks as master data change, workflow approval, shopping cart, or request initiation. For example, the Leave Request and Leave Request Approval tiles are both transactional type applications.

SAP recommends a simplified approach to transaction applications with a design concept guideline of 1:1:3 representing one user, one use case, and three screens. Complex tasks can be broken down into separate, smaller tasks that can be accomplished when abiding by this rule. This keeps the individual processes simple and intuitive and avoids confusing the user with additional functionality that may not be required.

- **Analytical**
  This type of application focuses on the visualization of key performance indicators (KPIs), where proper scaling, units of measure, and connotative color-coding provide business-related information to the user, who can decide to take action based on the results. Services of this nature should originate from an SAP HANA system due to possibly excessive data volumes.
- **Factsheet**
  Summary or detail information related to a particular business object within the system. This type of application gives the user the actual specifics he requires when making further management decisions. From this type of application, the agent can drill down to more detailed factsheets or initiate a transactional application to take action on the information provided. This application type should originate from an SAP HANA system due to the laborious calculations performed and voluminous details to be summarized.

When developing custom SAP Fiori applications, you'll want to consider which of these is most suitable for your particular task, whether that is updating master data, providing informational analytics, or presenting detailed information related to a specific business object.

In addition to selecting the application type, you next will need to determine the SAP Fiori tile type, which defines its appearance on the homepage. In the following section, we'll discuss the types of SAP Fiori tiles available.

14.7.4 SAP Fiori Tile Types

Upon first glance at the SAP Fiori Launchpad, you'll notice that not all tiles have the same appearance or composition. There are some that are descriptive, with icon and text only, while others have a graphical or quantitative nature. This presentation style can give the user insight into the type of application to be executed from the tile. For uniformity and consistency, SAP has established a collection of Fiori *tile types*.

The four SAP Fiori tile types are as follows:

- **Static**
  Tiles that perform a specific task regardless of any quantitative result found in the system are considered static tiles. There is only the text label and an icon displayed without any number shown to the user. An example would be the SAP Fiori application My Paystubs, where an employee can review his remuneration statement in PDF format or select Track Purchase Order to locate a specific P.O. document in the system.
- **Dynamic**
  A dynamic tile derives information from the system upon display. This could be the number of requests that a manager is required to approve, or it could be a product of an analytical tile showing the user a total number or average. The number can also be given a connotative color, spurring the agent to take further action.
- **News**
  Performing a single function, the News tile can handle RSS feeds and cycle news stories and news feeds depending on its configuration. Up to 10 URLs can be entered for the cycling of news stories. Also, a total of 12 images can also be used for the background display of the tile during news cycles.
- **KPI**
  For this type of application tile, analytical detail is incorporated into the display. For instance, a graph or chart can be shown along with the semantic color denoting to the user the current state of the information shown. If we look more closely at our earlier example of the Launchpad (see Figure 14.39) and focus on the Gross Revenue analytical tiles we can see how the scale has been set to the millions and the unit of measure is the currency key USD.

  Also, the color display of the figure is set to either green for on-target or red for under-performing, thus signaling to the user that action may need to be taken. When building custom KPI tiles, you use the *KPI Modeler* to choose the appropriate icons and charts or create your own models.

Now that we have provided an understanding of SAP Fiori application design, we'll cover the various deployment options of the software and the required UI components along with other technical considerations.

Note

To find more detailed information related to the design guidelines for SAP Fiori applications, visit *http://experience.sap.com/wp-content/fiori-guidelines*.

14.7.5 SAP Gateway

In deploying SAP Fiori, the implementation of SAP Gateway is required. The *SAP Gateway* establishes the connection between a non-SAP development technology and an SAP backend system. Thus, developers can use languages such as Java, Javascript, and C++ to access master data stored within the SAP Business Suite and, in particular, the HCM application. Similar to how SAP Fiori applications minimize the need for the user to understand the underlying SAP technical architecture, SAP Gateway eliminates the need for developers to have a strong understanding of the ABAP language to create new service applications.

There are two options for deploying SAP Gateway: either a locally installed instance on the SAP Business Suite, referred to as an *embedded* deployment, or a separate, stand-alone instance that is commonly called a *central-hub* deployment.

An embedded deployment, as shown in Figure 14.41, installs the core software components on the same SAP NetWeaver instance as the SAP Business Suite. The advantages of this type of installation is the reduced cost and performance overhead of an additional server. Plus, if the master data is sourced from only one backend system, this may be a preferable approach. However, the presentation, application, and data layers all reside within the same system, requiring us to expose the SAP Business Suite to the Internet. This can raise security concerns and does not promote a true separation of the presentation and data layers.

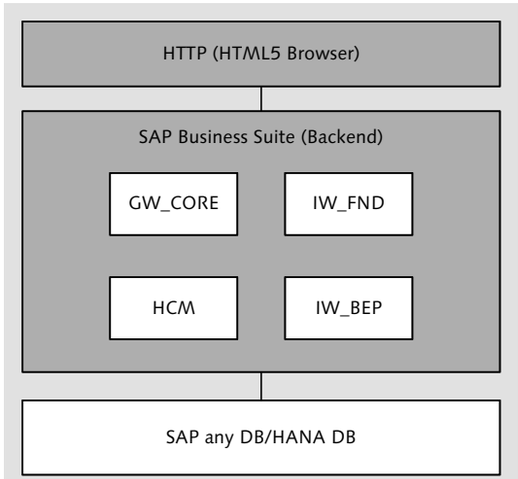

Figure 14.41 Embedded Deployment

The central-hub deployment option installs the SAP Gateway on a separate server from the backend SAP Business Suite, which gives us the separation of presentation and data layers desired in a truly distributed model, as shown in Figure 14.42. This installation type is conducive to placing the presentation server outside of the corporate firewall, thus eliminating the potential risks associated with exposing the SAP backend system to the Internet. Additionally, the backend system is not responsible for connectivity and request routing as in the embedded approach.

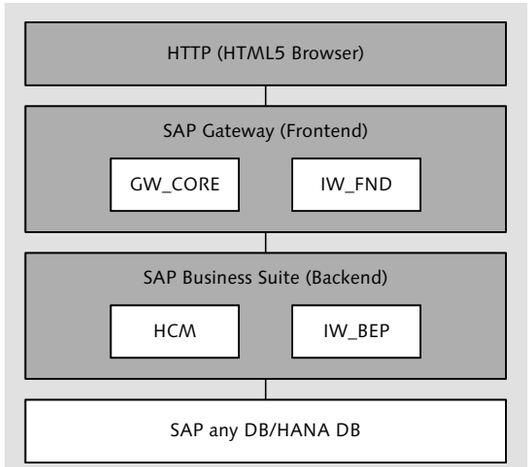

Figure 14.42 Central-Hub Deployment

The components of SAP Gateway, which are installed as add-on software, are shown in Table 14.3.

SAP Gateway Component	Type	Description
IW_FND	Core	Runtime and Metadata
GW_CORE	Core	OData Libraries
IW_BEP	Optional	Business Enablement Provisioning
IW_SCS	Optional	Screen-Scraping Generator
IW_CBS	Optional	Business Workflow Functionality
IW_HDB	Optional	HANA Database Adapter

Table 14.3 SAP Gateway Components

SAP Gateway Component	Type	Description
IW_SPI	Optional	Service Provider Infrastructure
IW_PGW	Optional	BPM Content
IW_GIL	Optional	Generic Interaction Layer

Table 14.3 SAP Gateway Components (Cont.)

For a central-hub deployment, there are configuration activities that must be coordinated between the frontend and backend systems, whereas in the embedded approach all such tasks are performed in the SAP Business Suite. The component `IW_BEP` dictates where application development will take place, whether on the SAP Gateway server or on the backend system. However, the core components are required to enable the SAP Gateway runtime environment and the OData protocol, which is covered in the next section.

Note

When running SAP NetWeaver 7.31 or earlier, you must install *UI Add-On 1.0 for NW 7.03 SPS09*, which contains the central UI components necessary to run the SAP Fiori applications. However, with the release of SAP NetWeaver 7.4, SAP Gateway is delivered embedded through the `SAP_GWFND` component. It comprises the same functionality delivered in the components `IW_FND`, `GW_CORE`, `IW_BEP`, and `IW_HDB`. Additionally, the central UI components are also included with this release level.

14.7.6 OData Protocol

Using the *Open Data Protocol*, or *OData*, SAP distributes data from its proprietary ECC system through consumer-grade electronics platforms, such as smart-phones, tablets, and other mobile devices. OData is a standard web protocol based on the Atom Publishing Protocol, and RSS, where metadata and data are enclosed in the same HTTP/XML type request. In this case, server-side data repositories are made readily available for access by various application languages. This has led to OData being referred to as the "ODBC of the Web." Using OData models, developers have a much simpler interface that does not require them to understand SAP data architecture. Initially created by Microsoft, many popular websites use this standard for their APIs and its use of the *REST* methodology. REST stands for *Representational State Transfer* and is used in distributed computing architectures. For applications to be considered in compliance with REST, they must meet the following design constraints: client/server, stateless, cacheable, layered, and uniformity.

For SAP-delivered applications, OData services must be activated prior to deployment. This is accomplished using Transaction /IWFND/MAINT_SERVICE on the SAP Gateway server and performing the following steps:

1. Choose Add Service and then enter the system alias of your backend system.
2. Next, enter the technical name of the OData service and the accompanying version number. Later in this chapter we provide the technical service names applicable to the SAP ERP HCM—delivered applications, such as the service for My Leave Requests, which is `/GBHCM/LEAVEREQUEST`.
3. Provide a technical name for the service under the customer namespace.
4. Assign the service to a package, or save it as a local object.
5. Execute the service and evaluate if it has been loaded properly from the Activate and Maintain Services screen.

14.7.7 Activating SAPUI5 Application Services

SAPUI5 application services must be activated from the Internet Communication Manager, which we covered in Section 14.6, using Transaction SICF. Navigate to the service path *default_host~sap~bc~ui5_ui5~sap* and find the application name. Right-click the service and choose Activate Service. For example, the My Leave Requests application service to be activated is `HCM_LR_CRE`, which you'll find under the service path mentioned above if you have installed the add-on component for the HCM principal applications.

Note

Similar to the ESS and MSS applications delivered through Web Dynpro Java and Web Dynpro ABAP, the SAP Fiori applications require that underlying SAP business processes have been configured prior to use. For example, the My Leave Requests application requires that Time Management has been implemented with the supporting absence types and quotas.

14.7.8 Fiori Launchpad Designer

The *Fiori Launchpad Designer* provides the ability to lay out a user's homepage and determine the applications he can access based on his assigned security role. The main page can be accessed from the URL *https://<server>:<port>/sap/bc/ui5_ui5/sap/arsrvc_upb_admn/main.html*. However, before the Launchpad Designer can

be executed, the service `arsrvc_upb_admin` under the menu path *default_host~sap~bc~ui5_ui5~sap* must be activated using Transaction SICF.

From the Launchpad Designer, the administrator is responsible for establishing the following configuration settings that control the distribution and access of the application(s):

- **Catalogs**
  This is the collection of applications assigned to a single role. The user can select applications from this catalog and choose to display them on his homepage. The application tile types discussed earlier comprise the catalog with KPI tiles, application launcher tiles, and target mappings that are linked to configuration performed using Transaction LPD_CUST.
- **Groups**
  The catalog consists of groups that define logically related applications to be displayed on the user's homepage, or the user can personalize the groups to add or remove applications in a group as he chooses.
- **Roles**
  The security roles are defined by linking the catalogs and groups to a single role. SAP provides standard roles that can be copied and customized as necessary, adding the security and menus. Roles are maintained by using Transaction PFCG.

14.7.9 SAP Fiori Applications for HCM

Currently, SAP has released six SAP Fiori applications for HCM as part of the add-on component SAP Fiori principal apps for SAP ERP 1.0, which you'll find in the Product Availability Matrix (PAM) on the SAP Support Portal. All of the applications are transactional types, and you can see that they are a part of either the Employee or Manager catalogs used in Launchpad Designer configuration. In the following subsections, we provide a brief description of each application and its associated technical components.

My Leave Requests

Employees can submit paid time-off requests, use an interactive calendar for date selection, provide additional comments, view pending requests, and review their remaining leave entitlements prior to submitting a new request. Following submittal, leave requests are then forwarded to the proper agent, most likely a supervisor,

for approval. Table 14.4 details the SAP Fiori components that are available to use when creating a leave request application.

SAP Fiori Component	Technical Name
UI5 Application	HCM_LR_CRE
OData Service	/GBHCM/LEAVEREQUEST
Business Catalog	SAP_HCM_BC_EMPLOYEE_X1
Business Catalog Group	SAP_HCM_BCG_EMPLOYEE_X1
Business Catalog Role	SAP_HCM_BCR_EMPLOYEE_X1
LPD_CUST Role	UIX01HCM
LPD_CUST Instance	TRANSACTIONAL

Table 14.4 SAP Fiori Components for Leave Request Applications

An example of the application UI is shown in Figure 14.43.

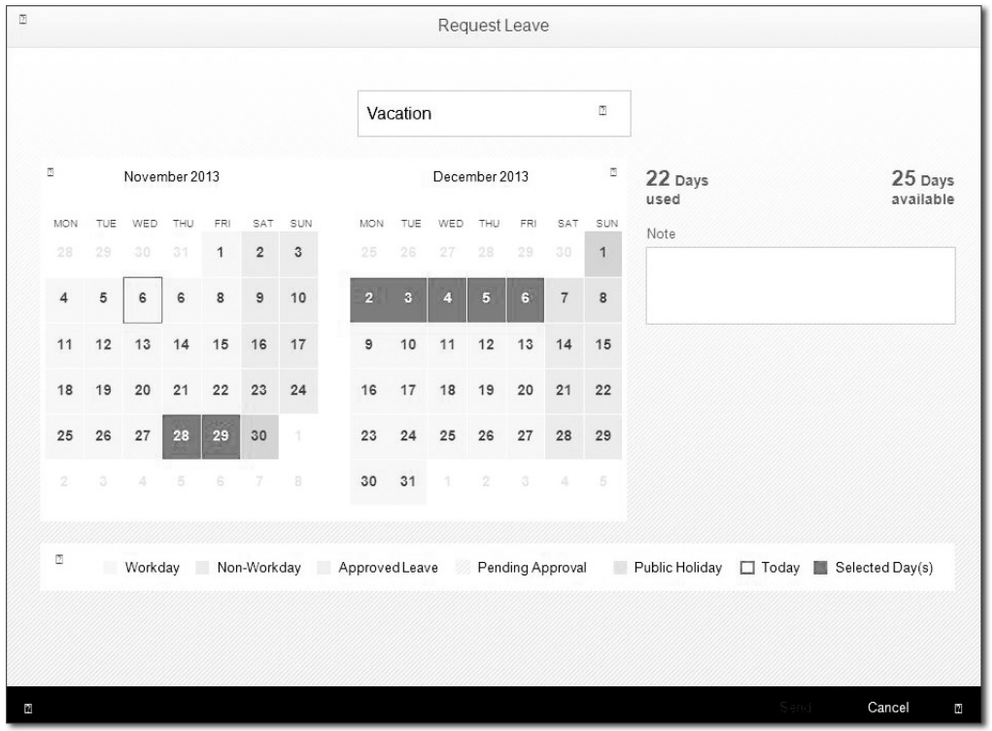

Figure 14.43 My Leave Requests

Approve Leave Requests

Managers, or HR professionals, can approve employee leave requests, reject requests, and provide additional comments to the employee. An inbox shows the user the active list of leave requests from which he can browse. Also provided is a team calendar so the manager can review overlapping time-off requests to avoid scheduling conflicts. Table 14.5 details the components that are available to create approve leave request applications.

SAP Fiori Component	Technical Name
UI5 Application	HCM_LR_APV
OData Service	/GBHCM/LEAVEAPPROVAL
Business Catalog	SAP_HCM_BC_MANAGER_X1
Business Catalog Group	SAP_HCM_BCG_MANAGER_X1
Business Catalog Role	SAP_HCM_BCR_MANAGER_X1
LPD_CUST Role	UIX01HCM
LPD_CUST Instance	TRANSACTIONAL
PFCG Role	SAP_GBHCM_LEAVE_APPROVAL_MGR

Table 14.5 SAP Fiori Components for Approve Leave Applications

Approve Timesheets

Managers can view employee time entries prior to approval or rejection. A report is available for summarized display of time entered by an employee or cost details. See Table 14.6 for application details.

SAP Fiori Component	Technical Name
UI5 Application	HCM_TS_APV
OData Service	SRA010_TIMESHEET_APPROVAL_SRV
Business Catalog	SAP_HCM_BC_MANAGER_X1
Business Catalog Group	SAP_HCM_BCG_MANAGER_X1
Business Catalog Role	SAP_HCM_BCR_MANAGER_X1
LPD_CUST Role	UIX01HCM

Table 14.6 SAP Fiori Components to Approve Timesheets

SAP Fiori Component	Technical Name
LPD_CUST Instance	TRANSACTIONAL
PFCG Role	SAP_HCM_TS_APV_APP

Table 14.6 SAP Fiori Components to Approve Timesheets (Cont.)

My Benefits

Employees can review their current benefit enrollment along with benefit plans for which they may be eligible but have not enrolled. A benefits overview screen can be displayed along with employee coverage options and cost details (see Table 14.7 for custom application details). In addition, a link to supporting Benefits Summary documents is available to the employee, thus meeting your company's benefits administration requirements in making such information readily available to the employee.

SAP Fiori Component	Technical Name
UI5 Application	HCM_BEN_MON
OData Service	SRA007_BENEFITS_SRV
Business Catalog	SAP_HCM_BC_EMPLOYEE_X1
Business Catalog Group	SAP_HCM_BCG_EMPLOYEE_X1
Business Catalog Role	SAP_HCM_BCR_EMPLOYEE_X1
LPD_CUST Role	UIX01HCM
LPD_CUST Instance	TRANSACTIONAL
PFCG Role	SAP_HCM_BEN_MON_APP

Table 14.7 SAP Fiori Components for My Benefits Application

Requirements to use this application include the activation of business function HR-BEN and the standard configuration of benefits in the SAP ERP HCM application.

My Paystubs

Employees can access their pay advices for both on-cycle and off-cycle payments. They also has the option to download a PDF version of the document for storage on their remote device. See Table 14.8 for custom application details.

SAP Fiori Component	Technical Name
UI5 Application	HCM_PS_MON
OData Service	SRA006_SRV
Business Catalog	SAP_HCM_BC_EMPLOYEE_X1
Business Catalog Group	SAP_HCM_BCG_EMPLOYEE_X1
Business Catalog Role	SAP_HCM_BCR_EMPLOYEE_X1
LPD_CUST Role	UIX01HCM
LPD_CUST Instance	TRANSACTIONAL
PFCG Role	SAP_HCM_PS_MON_APP

Table 14.8 SAP Fiori Components for My Paystubs Application

My Timesheet

Employees can enter time using the My Timesheet application on a weekly or monthly basis (see Table 14.9 for details). Submitted time can be reviewed and corrected as required along with summarized time reports for display. The application requires the setup of the CATS (Cross-Application Time Sheet) within the SAP ERP HCM application, and data entry profiles must be created for employees prior to use.

SAP Fiori Component	Technical Name
UI5 Application	HCM_TS_CRE
OData Service	SRA002_TIMESHEET_SRV
Business Catalog	SAP_HCM_BC_EMPLOYEE_X1
Business Catalog Group	SAP_HCM_BCG_EMPLOYEE_X1
Business Catalog Role	SAP_HCM_BCR_EMPLOYEE_X1
LPD_CUST Role	UIX01HCM
LPD_CUST Instance	TRANSACTIONAL
PFCG Role	SAP_HCM_TS_CRE_APP

Table 14.9 SAP Fiori Components for My Timesheet Application

Note

For continuing release information related to the SAP Fiori Principal Apps for SAP ERP 1.0, consult OSS Note 1930165 for specifics on additional support packs and implementation.

In addition to the application type, you'll want to determine the SAP Fiori tile type and its appearance on the homepage. In the following section, we'll discuss the different types of SAP Fiori tiles.

14.7.10 Developing SAP Fiori Applications

Now that the SAP Business Suite is accessible to other languages, custom applications can be developed using HTML5 and CSS3 technologies. For the development of SAP Fiori applications, SAP has made available the *SAP UI Development Toolkit for HTML5 (SAPUI5)* for Eclipse. This is a desktop editor containing the control libraries for building custom SAP Fiori applications.

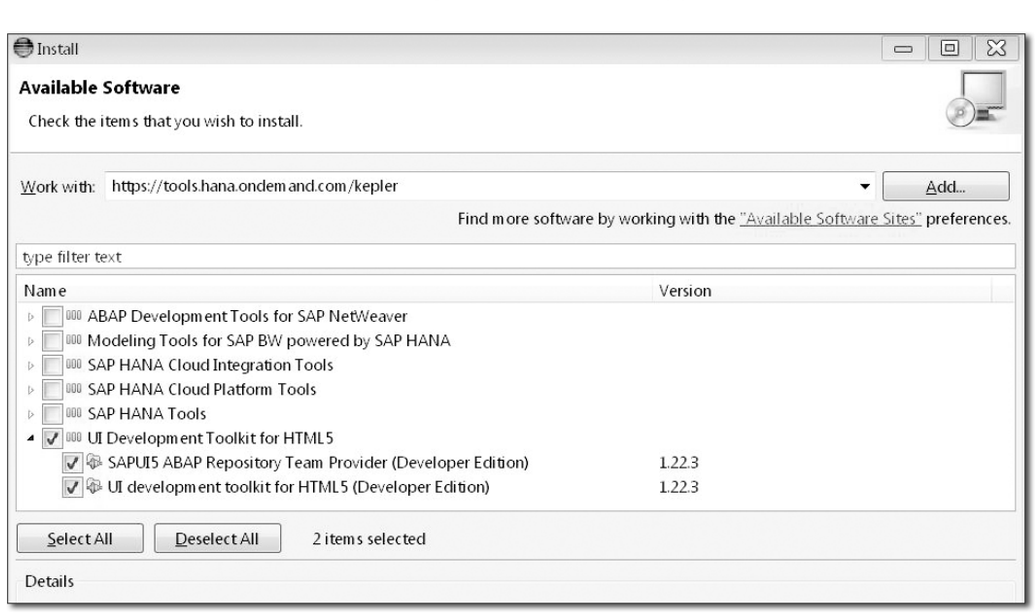

Figure 14.44 UI Development Toolkit for HTML5 Installation

You can find the directions to install the SAPUI5 toolkit on the Kepler version of the Eclipse editor at *https://tools.hana.ondemand.com/kepler*. Click the SAPUI5 TOOLS link at the top of the page to navigate to the step-by-step instructions on how to install and upgrade the toolkit. From Eclipse, choose Help • Install New Software to display the screen shown in Figure 14.44.

On the SAPUI5 TOOLS page, you'll find URL links to helpful documentation such as developer's guides and control library specifics as well as sample demo applications. The materials can be found under the link SAPUI5 Documentation (as shown in Figure 14.45).

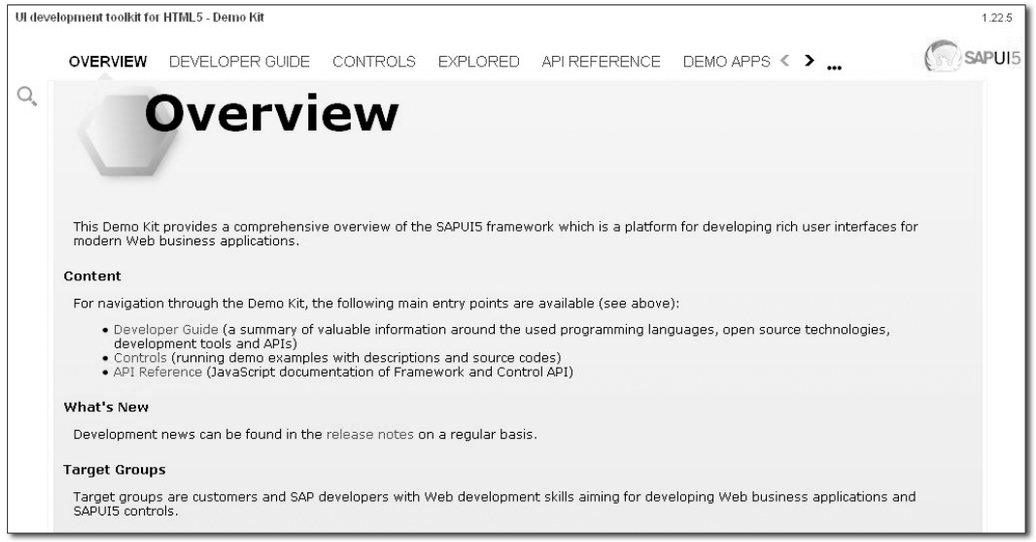

Figure 14.45 SAPUI5 Documentation

Besides desktop development, you can also evaluate the *SAP River RDE* web-based development environment from the SAPUI5 TOOLS page. SAP River RDE is the development environment for SAP Fiori applications distributed on the SAP HANA Cloud Platform. You can visit the SAP Service Portal (*service.sap.com*) to find out more about applying for a trial version of the *SAP HANA Cloud Platform Cockpit*, shown in Figure 14.46.

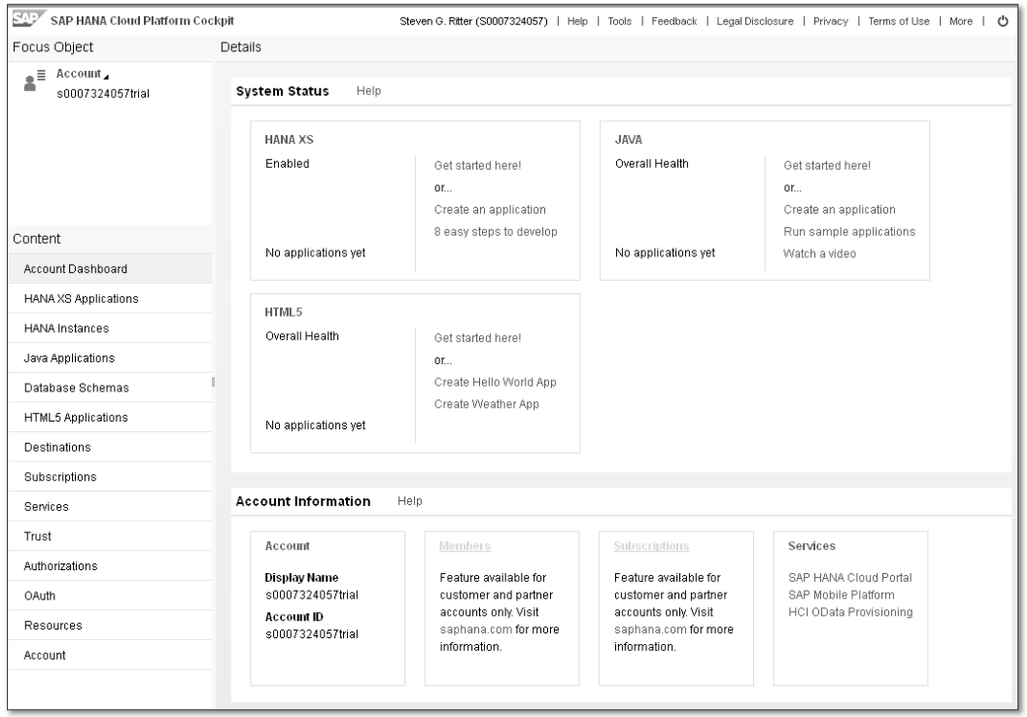

Figure 14.46 SAP HANA Cloud Platform Cockpit

14.8 Summary

In this chapter, we've covered the self-service functionality provided by SAP, focusing on the Employee Self-Service and Manager Self-Service applications. We also discussed the manner in which SAP continues to improve on their solutions with enhancements and upgrades provided through enhancement packages, covered in Section 14.2, including the activation of the related business functions.

With the transition to non-portal delivery of ESS and MSS, SAP NetWeaver Business Client for HTML provides employees, managers, and HR administrators with access to applications based on Web Dynpro for ABAP technology. The new applications seek to provide better integration and improve on the user interface and user experience of these processes.

We then discussed in greater detail how to access Web Dynpro for ABAP applications through SAP standard security configuration and authorizations, including the navigation and setup of the ESS (WDA) service maps. In our coverage of MSS (WDA), we showed you how the Object and Data Provider and Object-Based Navigation provide managers with a graphical representation of their organization and assist them in initiating applications from selected objects.

Next, we covered the Internet Communication Manager and the handling of HTTP requests for the ERP system. Within the Internet Communication Framework, we showed you how to activate and modify web-enabled HTTP services.

Finally, we covered the latest UI innovations from SAP with SAP Fiori UX, SAP Gateway, OData services, and the SAPUI5 development toolkits. Applications developed with these technologies provide users with multiple options to interact with the SAP Business Suite and SAP ERP HCM.

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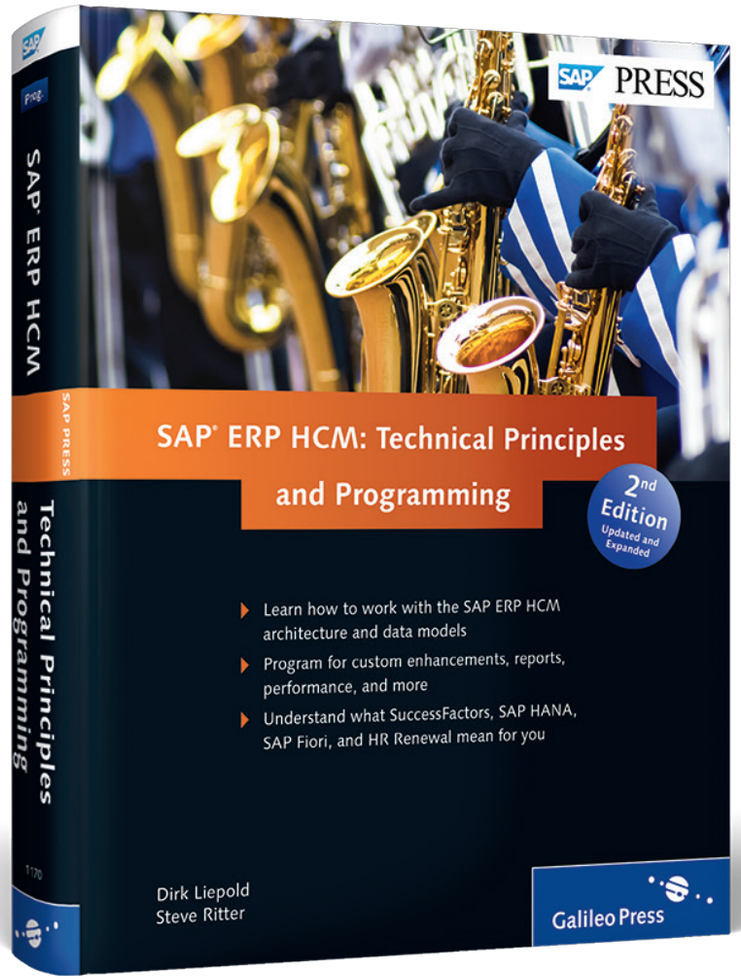

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