

Re-use Architectures at SAP

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***Abstract.** This paper gives an overview of three different technologies employed by SAP that have code reuse among its characteristics. The first technology presented is the Enhancement / Switch Framework, used by different industry solutions developed by SAP like, for example, the automotive industry. The next technology comprises the Composite Application Framework, which uses pre-defined components in order to build business application requiring a minimum programming expertise from the user. The last technology presented is the Unified Legal Reporting framework that is geared towards code and data re-use in an environment of fast-paced legal changes in the HCM area.*

1. Introduction

In the SAP terminology, an Industry Solution (IS) is a specialized solution that executes on top of the core ERP system. Today SAP provides ISs to different industry sectors, such as airspace and defense and oil and gas. An IS represent the known best practices within a given business. However, as business are always changing, a IS must be able to be constantly modified, causing little impact on the customer business. In this context is presented the Enhancement / Switch Framework, a technology developed by SAP focused on enhancements for both IS and standard code as well.

SAP Composite Application Framework (CAF) is a standardized platform for developing applications quickly and cost-effectively, creating composite applications that sit on top of services from many underlying systems[1]. These applications have a greater degree of freedom to optimize the user experience and provide new tools for supporting and extending the way in which people work.

Legal Reporting in HCM is a horizontal solution, i.e. used by all industries. As such, a typical legal report is customized to a type of business and it may have code additions on the customer side to cope with business requirements specific to one single company. In an environment where laws are frequently changing it is imperative to stay up-to-date with the legal standard and at the same time maintain any local modifications. The Unified Legal Reporting framework provided by SAP enables the modification every single part of a legal report, and legal and business processes in the standard. At the same time it enables standard deliveries of legal changes for both code and customizing data while keeping all local modifications.

In the next section the Enhancement / Switch framework is presented. Section 3 presents the Composition Application Framework and section 4 the Unified Legal Reporting framework, and the summary is presented in section 5.

2. Enhancement Framework / Switch Framework

Using the Enhancement / Switch framework [2], specific functionalities of an IS can easily be added on top of the core ERP system without the need of modifications in the original source code. These modifications can be added as source code plug-ins or new elements of graphic user interface, such as a new menu item or a new text field. As these enhancements do not belong to the standard namespace, the upgrade process of an ERP system becomes less prone to problems. Enhancements are treated as customer specific objects.

By means the Enhancement Framework, all IS share the same core source code. Functionalities of a specific IS are added as different development objects. This also enables that a specific IS uses functionalities provided by other IS without a major effort. Specific functionalities provided by an IS can be activated or deactivated using the switch framework. The switch framework works hand in hand with the enhancement framework. Specific enhancement objects lying in different namespaces can be grouped into function sets and associated with a specific switch. Once a specific switch is “switched on”, all development objects that belong to it become active inside the system.

This way, the process of adding or remove a specific functionality for an IS can be seen as a customizing procedure, using the so called switches. Figure 2 shows the architecture diagram of the switch framework. On the left there are business function sets. On the right are the existing code bases (both core and IS) that are contained in the repository. Packages act as containers for development objects.

This approach enables those enhancements to be added in different levels in the ERP system, as depicted in Figure 1.

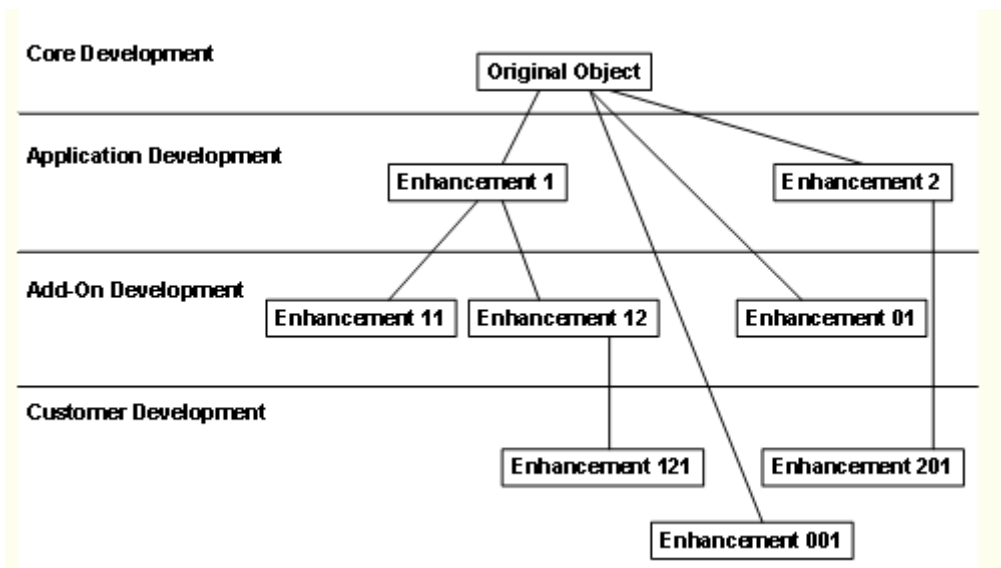


Figure 1 - Enhancement Objects at different levels [3]

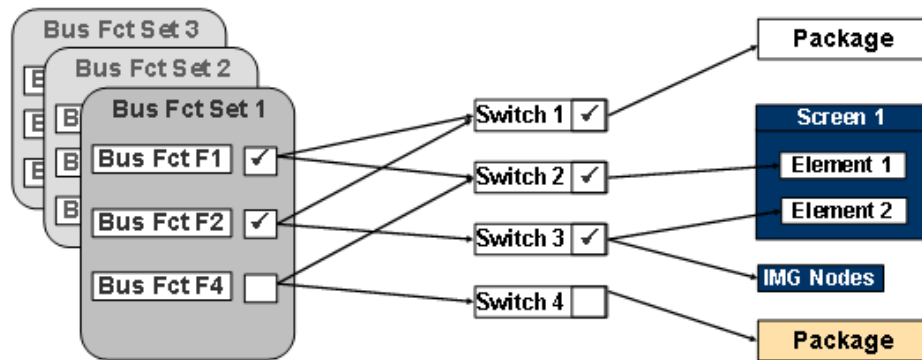


Figure 2 - Switch Framework Basic Architecture [3]

From SAP ECC 6.0 on, all IS provided by SAP will follow this development model. The main idea behind this strategy, besides the adoption of a common enhancement framework, is to facilitate system customizing, promotion of code reuse, and also the ease of the upgrading process.

3. Composite Application Framework

A component of the SAP NetWeaver CE (Composite Environment) platform, SAP Composite Application Framework is an application development tool that allows innovative response to new IT challenges in a competitive business environment. SAP CAF provides design tools, methodologies, rules, and patterns for building composite applications that pull together information and services from diverse sources to support collaborative business.

The basis of SAP CAF is SAP NetWeaver CE, which enables building and running applications based on Service-Oriented Architecture (SOA) principles[4]. It offers a set of capabilities for integrating new and existing services – both by SAP and proprietary, into business-specific solutions. You can develop portable standard-compliant applications based on the Java Enterprise Edition (Java EE) technologies and integrate them with existing SAP and third-party solutions using a central enterprise service registry.

SAP NetWeaver CE builds upon several proven technologies that have been enhanced and integrated to provide greater functionality and improved development flexibility. Among them are the SAP Composite Application Framework tool for service composition, the SAP NetWeaver Developer Studio (NWDS) tool for developing Java applications, the SAP NetWeaver Visual Composer (VC) tool for the creation of portal content and analytics applications, the Web Dynpro development environment for user-interface development, and the Guided Procedures (GP) for implementing business processes across multiple applications.

These technologies enable you to generate model-oriented source code and tables while hiding the complexities that are not relevant in the current context. In this way, developers are relieved of the creation of important but repetitive and unchallenging source code such as reading and writing methods or calls for authorization checks. CAF

applications are composed using already existent external services as well as creating new ones. UI parts can be built using one of the UI tools such as Visual Composer, which has no need to implement any line of code. Finally, parts of the application can be plugged together in a business process that will follow defined rules.



Figure 3 - SAP NetWeaver CE -- a Strategic Platform for Enterprise SOA [5]

4. Unified Legal Reporting

All legal environments have at least two things in common: They are hard, if not impossible, to control. That notwithstanding, a business must adhere to the laws and regulations of the country it operates in. The combination of an environment where ever-changing, external factors determine proceedings, coupled with local, company-specific processes and the need for regulatory compliance at any cost make for a challenging environment for the management of compliance, business processes and the software installations that handle it.

A typical scenario at big companies is a standard software implementation for HCM, such as SAP's HCM module. This standard software will, also typically, be modified in code and customizing to enhance the standard legal processes covered in the software by company-specific rules and local business processes. In this scenario, change management becomes an important issue: Every legal change requires a modification of the standard software that should, preferably, be completely automatic while not affecting local modifications or additions. It should be easy to apply and not cause major costs or friction.

SAP's Unified Legal Reporting tackles these requirements by providing a highly modularized framework for reporting with well-defined interfaces at all levels.

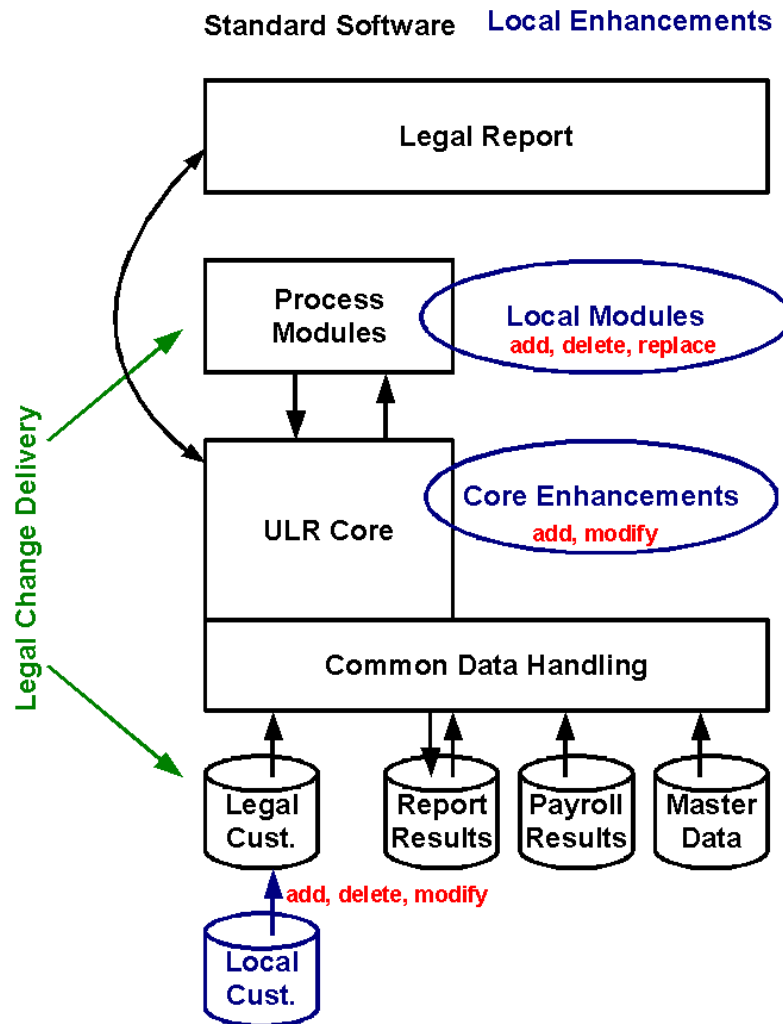


Figure 4 – Unified Legal Reporting framework - overview

The URL core is completely object oriented. Any of its classes can be inherited and modifications used to replace the base class. This technique is used by SAP to adapt the base classes to legal reports. In effect, the URL core for each legal report is built up from a few base classes and a few specialized classes inherited from the framework. Typical cases for this specialization are the classes modeling employees and the application itself. In a last step, a customer has the option to further specialize these classes. This, however, is almost never done.

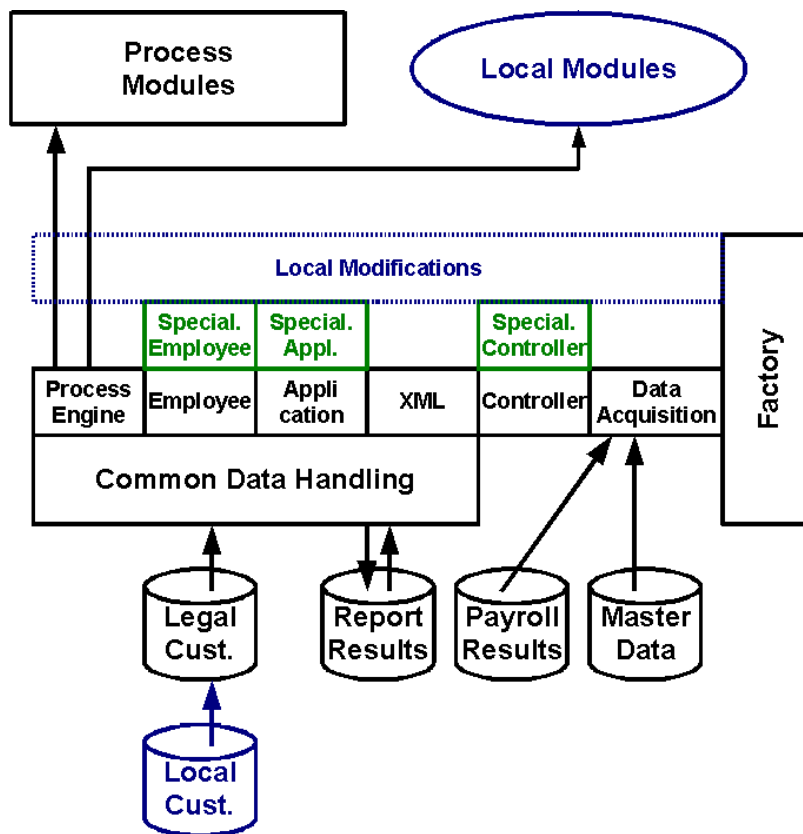


Figure 6 – URL core and process. For clarity not all connections are shown.

Local modification and enhancements normally come on the process level. As shown in figure 6, legal and business processes are completely modularized. The modules are executed by a process engine that takes its configuration from a set of standard tables with customizing provided by SAP (legal requirements) and a second set for local customizing, allowing for local additions. The stream of legal deliveries is only ever delivered to SAP standard code and customizing, maintaining all local changes. New legal changes can be automatically implemented without re-applying local modifications. Since all process modules are treated equally in this model there is no need for enhancement spots, user includes or other techniques of this type that allow for enhancements in specific, pre-defined places.

As a result of this modularization technique the data flow through any application is easily traceable, and separation of data is enforced. Local projects on customer sites are easier to maintain and keep up-to-date with legal requirements.

5. Summary

This paper presents three different technologies employed by SAP focused in code reuse in widely different contexts. Using the enhancement framework along with the switch framework, specific functionalities used by different IS can be added or removed with no major effort from the user.

Using SAP CAF and its tools, new applications can be composed quickly, allowing you to consume external services, adapt them when necessary, create new services, build UIs and business processes. This enables people to concentrate more on the demanding parts of the application, such as business rules, than on development activities.

Using the Unified Legal Reporting framework legal reports can be adapted locally, both in code and customizing, while at the same time staying on top of the standard “stream” of legal changes delivered. Local changes can be tracked easily by technical and non-technical personnel, thereby easing project management and management of business processes in a difficult and hard-to-control environment.

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