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Technical Reference

Salespoint 5

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# Preface

## Typographic Conventions

Two typographic conventions are employed throughout this document to highlight specific phrases. The following paragraphs describe when and why these highlightings are used:

Keywords

The Keyword font is used to denote variable names, class names, type names, java keywords, java package names and so forth.

Termini

Proper names and termini ate printed in termini font.

## Introduction

The Salespoint Framework is intended to minimize developing effort of point-of-sale applications. Salespoint 2010 users complainted about complexity, missing features and bugs. Thus, the decision was made to re-design and re-implement the framework from scratch. In 2013 some parts again were re-implemented with components of the spring project. Our development goal was an easy-to-use framework primarily targeted for educational purposes. As such Salespoint 5 is not tailored to any specific application, but designed with a wide area of applications in mind.

Models and design patterns employed in Salespoint 5 are inspired by “Enterprise Patterns and MDA: Building Better Software with Archetype Patterns and UML” by Jim Arlow [1]. An overview of the functionality of the new features in Salespoint 5 are detailed in this document.

We would like to thank all Salespoint users who submitted their feedback and encourage future users of Salespoint 5 to do the same.

# Technical Background

One of the main reason to use a framework such as Salespoint for educational purpose is to teach students reusability. The Salesoint 5 developers also adhere to that principle. Thus, Salespoint 5 itself uses a number of frameworks and APIs, which are introduced briefly. The software architecture of Salespoint 5 applications is also detailed.

## JPA – Java Persistence API

One of the key features of Salespoint 5 is its integrated persistence layer. The goal is to allow data persistence, while minimising programming effort and training period as well as maximising flexibility for framework users.

The obvious choice was the Java Persistence API (JPA), a Java framework managing relational data in Java Standard Edition or Enterprise Edition applications. Salespoint 5 uses JPA 2.0, developed under JSR 317 and finished in Dec, 2009 [2].

Additionally to the API itself, which is defined in the javax.persistence package, JPA also consists of Persistence Entities, ORM Metadata and the Java Persistence Query Language (JPQL).

A persistence entity is usually a Plain Old Java Object (POJO), which is mapped to a single table in a database. A row in such a database table corresponds to a specific instance of such an entity. Relational data between entities (and therefore tables) may be specific as annotations in Java source code. Salespoint 5 uses annotations to provide object/relational metadata.

Persistence entities may be related to each other by an inheritance hierarchy. A persistence entity may have a non-persistent superclass. Fields declared by a non-persistent superclass are not stored in the database if an inheriting entity is persisted. Three schemas exist to persist entities with an inheritance relationship: single table, join table and table per class.

The single table strategy stores all instances of classes of an inheritance hierarchy in the same table. The table contains columns for every attribute a persistence entity in the hierarchy declares. The different types are distinguished by a type discriminator column. The discriminator value for each persistence entity in an inheritance hierarchy is generated automatically or can be supplied by the user.

The join table strategy uses a table for the root persistence entity of the inheritance hierarchy. Additionally, a table is added for each persistence entity in the inheritance hierarchy. In the supplementary tables, a foreign key is used to reference a row in the table of the parent persistence entity. Each table contains only columns for fields declared by a specific persistence entity in the inheritance hierarchy, but neither for the entities children nor parents. To reconstruct an object from the database, the different tables have to be joined using this foreign key, thus the name of this strategy.

The table per class strategy creates a table for each persistence entity containing all fields of the class, including inherited fields.

The inheritance strategy of an inheritance hierarchy has to be declared at the root persistence entity. The inheritance strategy may not be changes for a sub-hierarchy, because JPA 2.0 does not require this feature. JPA 2.0 only requires the single table and join table strategies to be implemented. Salespoint 5 uses the single table strategy exclusively.

The query language JPQL, which is similar to SQL, is used to retrieve entity information from the database. In contrast to SQL, JPQL queries act on entity objects instead of database tables. JPA implamentations translate a JPQL statement to SQL statement at run time. It is possible to replace the database management system (DBMS) while keeping the Java classes. Furthermore it is possible to interface directly with the DMBS using Native Queries. Salespoint 5 however, uses the Criteria API [2] [3] to facilitate type safe querying.

Multiple implementations of JPA 2.0 exist, for example TopLink [4] and EclipseLink [3]. The open source persistence and ORM framework Hibernate [5] also supports JPA 2.0. Salespoint 5 uses the JPA 2.0 reference implementation, EclipseLink. No implementation specific code is used in Salespoint 5, therefore it should be possible to interchange EclipseLink with another JPA 2.0 implementation[[1]](#footnote-1).

## Spring

In contrast to earlier versions of the Salespoint Framework, Salespoint 5 obeys the MVC pattern. Salespoint 5 can be seen as the Model of an MVC application, no parts of the View or the Controller are implemented in the framework.

Salespoint 5 is designed as basis for development of web applications, using the Spring Framework [6] to implement Views and Controllers. To further ease the development, Salespoint 5 includes property editors to convert string based representations to Salespoint 5 identifier types. Furthermore, JSP tags to check, if a user is logged in and if a user has a certain capability are included in the framework.

As a big new approach in development with JPA, the Spring Framework with its repository interfaces can make the work very fast, clean and easy. The Crudrepository provides the basic methods for working with the database (CRUD stands for Create, Read, Update and Delete).

## JodaMoney

In Salespoint 5.3.X money class and its related components were replaced by the Joda-Money[[2]](#footnote-2) project. Prices and other money values are represented as org.joda.money.Money or for more precisison as org.joda.money.BigMoney objects.

Due to the fact, that all representing objects are immutable, all arithmetic functions produce a new object (see Listing\_1.0).

Money value\_1 = Money.parse(“USD 23.07”);

Money value\_2 = Money.parse(“USD 18.07”);

Money sum = value\_1.plus(value\_2);

Joda-Money also supports Currency (see Listing\_1.0). A set of loaded currencies is provided by an instance of CurrencyUnitDataProvider. But new and funky CurrencyUnits can be created to. So with this currencies, money values can be converted from one to another currency.

## Software Architecture of a Salespoint 5 Application

Software often need to be adaptive, flexible and extendable. Using a suitable architecture pattern, such as the Model-View-Controller (MVC) pattern, helps to meet these non-functional requirements. Figure 1 gives an overview of how a Salespoint 5 application is modelled. Salespoint 5, as domain framework, takes the place of the model in the MVC pattern. The model can be extended by sub-classing Salespoint 5 classes or by introducing entirely new classes. Salespoint 5 model classes and sub-classes thereof are transparently stored in a database. If new classes are added to the model and their state is also required to be persistent, the developer also has to facilitate persisting those objects using the JPA-API.

The controller and view are application-specific and have to be implemented by the user. Although Salespoint 5 does not require a specific framework or API like Swing [7] or SWT [8]. However, because Salespoint 5 is intended to be used in conjunction with the Spring MVC [6] framework for SWP at TU Dresden, Salespoint 5 contains supplementary code, easing the development of Spring applications. This supplementary code consists of Spring MVC PropertyEditors, and custom, Salespoint 5 specific JSP-Tags.

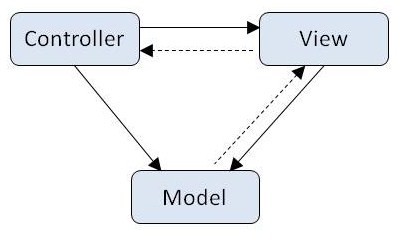


Figure MVC-pattern of a Salespoint 5 application divided into application specific code and framework code.

## Configuration of Salespoint 5

The configuration for an application can be modified on the application class in the root package (e.g. videoshop.Videoshop for the videoshop project).

Methods, annotated with @Configuration, will be scanned at the beginning of the deployment on the application server (in this case Spring Boot). This configuration files will tell the application server the settings for the application.

By overriding the configuration method, you can specify the login behaviour or security functions. For a basic login strategy the videoshop is a good start. There you can see, that with authorizeRequests() an authorization will be set. Following by matchers, you can specify the pages, this authorization is made on.

Further, you can easily set an login page with formLogin() and the path to the login page with loginProcessingUrl("/login"). Analogue the logout settings works like login system.

## DataInitilizer or filling Application with Test-Data

Every Application should be tested, so an easy way is, to use test data. So for this goal a recommend solution is, to load on every start of the application a bundle of test data into your system.

As shown in the Videoshop project, a Datainitilizer class is registered and creates a lot of data and finally adds this data to the application. For that purpose the Salespoint has an Interface org.salespointframework.core.DataInitializer, which can be used.

# Salespoint 5 Components

## Useraccount

To manage system accounts, Salespoint 5 has a notation of a user in the form of the User interface. Users are managed by the UserAccountManager, who is also an interface. Every user is uniquely identified by a UserIdentifier, which also serves as primary key attribute for the database. The UML model is depicted in Figure 3.3.

### UserRole

Roles in conjunction with authorization tag hasRole()[[3]](#footnote-3) can be used to change the appearance of a View, depending on a user’s status. For example, a View for a user having an “administrator” role may display different content, for example delete buttons, than for a user not having that role. Thus, roles allow for flexibility and assist in code reuse, when designing the View.

### Login

To reduce code repetition, Salespoint 5 contains code to automate user log in. Using a JSP template, a special login form is generated, which is handled by an interceptor[[4]](#footnote-4). The interceptor verifies the user password and associates the current session with the user using <login> and <logoff>. The session is required, because multiple users can be logged on at the same time.

### Limitation

Due to the fact, that Salespoint use the SecuirtyContext for authentication, the user account cannot so easily be extended. The useraccount provides a username, a password, a list of roles and a boolean, if the useraccount is enabled or not. If this properties don’t meet all requirements, the useraccount has to be expand its features as shown in videoshop project.

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1. This document will be updated, as soon as another JPA provider is tested with Salespoint 5. [↑](#footnote-ref-1)
2. www.joda.org/joda-money [↑](#footnote-ref-2)
3. Expression-Based Access Control, Part IV. Authorization [http://docs.spring.io/spring-security/site/docs/3.0.x/reference/el-access.html] [↑](#footnote-ref-3)
4. An Interceptor is a Spring concept. [↑](#footnote-ref-4)