

eCT: THE B2C E-COMMERCE TOOLKIT

for the WebComfort Platform

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Abstract: Electronic commerce (e-Commerce) involves a complex set of business workflows regarding the buying and selling of products or services by means of electronic systems such as the Internet. e-Commerce applications can be supported, amongst other alternatives, by content management systems (CMS) through specific extensions.

This paper presents the eCT extension, an e-Commerce extension developed on the top of the WebComfort CMS platform, whose main goals are: (1) *adaptability* to different contexts, such as different types of stores, countries, cultures or tax systems; (2) *extensibility*, due to the ease of development and addition of new functionalities; and (3) *ease of installation and configuration*, to fulfill different business requirements. This paper discusses the major technical details of the eCT, such as: (1) the product facet model; (2) the support to different e-commerce models; and (3) the support for different payment, shipping and taxing methods.

1 INTRODUCTION

Electronic commerce (e-Commerce) involves business processes related to the buying and selling of products over electronic systems, such as the Internet. Electronic commerce is expected to continue growing at a rapid pace, and organizations are using it to reach a wider audience and create new business opportunities, through "electronic shops", that offer products from a single firm, or from multiple individual stores (electronic shopping malls (Khosrow-Pour, 2006).

On the other hand, in the last years, a number of web-oriented content management systems (CMS) (Suh et al., 2003) has appeared, aiming to facilitate the management and publication of digital contents. These systems allow the collaboration of the various users involved in the process of creating and organizing digital content, and typically provide extension mechanisms that support the addition of new types of content as well as new languages and visual themes. These systems are providing organizations a way to support their needs for constant evolution and complex business requirements.

This paper is structured in five sections. Section 1 introduces the broad context of e-Commerce and CMS concepts. Section 2 introduces the eCT (the B2C e-commerce Toolkit for the WebComfort platform). Section 3 overviews of the eCT architecture and its extensibility features. Section 4 discusses some of the architectural decisions taken during the development of this toolkit. Finally, Section 5 presents the conclusions for this project so far, as well as the future work.

2 THE ECT TOOLKIT

The "e-Commerce Toolkit" (eCT for short) is an e-commerce extension for the WebComfort platform (WebComfort.org, 2008). WebComfort is an Enterprise CMS, promoted by SIQuant (SIQuant, 2008), developed on top of Microsoft ASP.NET technology.

In the WebComfort platform, a *Module* provides mechanisms to manage and layout a certain kind of content (e.g., images, text, links), and a *Toolkit* is an integrated collection of modules that provide specific functionalities. For example, the WebComfort Stan-

standard Toolkit defines a set of modules allowing the management and visualization of typical Web contents (e.g., images, text).

The eCT is a Toolkit for e-commerce support, more specifically for Business-to-Consumer (B2C) business model. From a quick perspective, the eCT allows the configuration of one or more electronic stores, that allow customers to browse the product catalog, add products to the shopping cart and proceed to the check-out. On the other hand, store administrators can configure and manage a number of store details (such as product catalog, inventory, promotions and orders) whereas eCT administrators manage aspects that are available to all the stores (such as languages and localization, currency units, shipping/payment and taxing methods).

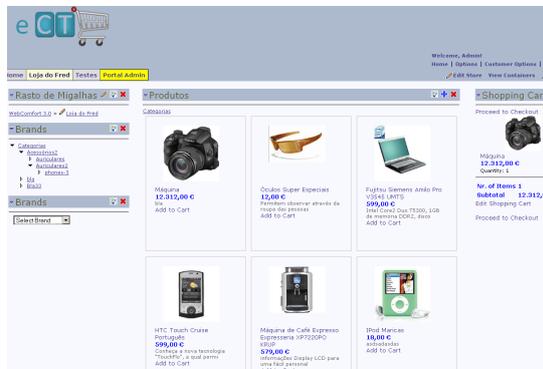


Figure 1: A WebComfortPortal with the eCT toolkit.

3 ECT EXTENSIBILITY FEATURES/AREAS

The eCT is an extension to the WebComfort platform, aiming to support electronic stores that can be based anywhere on the world and available to a global audience. Due to the variability of possible contexts, the eCT must provide solutions for the different aspects that can vary (e.g., languages, payment systems, shipping systems, taxation, currencies, types of products to sell). So, the main principles that guide the design of the eCT are:

1. *Adaptability* to different contexts (such as different countries and cultures, types of stores);
2. *Extensibility*, namely by the ease of development and integration of new features;
3. *Ease of installation and configuration*, allowing a quick setup of eCT according to stores' different business requirements.

This section discusses how these principles were taken into consideration during the eCT design.

3.1 Overview

The eCT aggregates a set of WebComfort modules that implement B2C e-commerce functionalities. The eCT has a multi-tier (three-tier) architecture, with the typical presentation, logic and data layers, with a WebComfort module being transversal to this tiers (see Figure 2). The presentation tier of a module contains the UI elements (Web User Controls and Web Forms) that present information to the user and interpret/respond to their actions.

The logic tier contains the module's business logic. This level can interact with the WebComfort API, that provides a set of infrastructural features available to the WebComfort modules, like authentication or multi-language support. In a similar way, infrastructural features of the eCT are provided by the eCT API, that cover areas like: eCT configuration, store configuration, store operation management, catalog, inventory and promotions. The eCT configuration involves the configuration of global options shared by all stores; the store configuration involves the configuration of each store options (e.g., accepted shipping/payment/taxing methods, currency units); the store operation management involves the management of orders, customers and statistics; the catalog refers to the storing and management of product data; the inventory corresponds to the information of the physical storing of products; and promotions corresponds to the features that allow the promotion of certain products. At the eCT level, there are a number of possible extensions, namely: Product facets; Shipping; Payment; Taxing; Logging; Statistics and Reporting; and Currency Units.

The Data tier isolates the persistence aspects of the module. The eCT toolkit uses two data repositories, for the eCT data and statistics/logging data.

Now we present in more detail some of the more relevant aspects/features of the presented architecture.

3.2 Product facet model

One main requirement identified was the support for different types of products (e.g., books, digital files), which may differ in the way they are presented to the end-user, as well as in internal behavior. The eCT supports the notion of a "base product", which can be specialized or extended by applying facets according to the context. These facets can be perceived as extensions to a product, that can add a certain behavior and/or data. For instance, in a fine arts portal we can

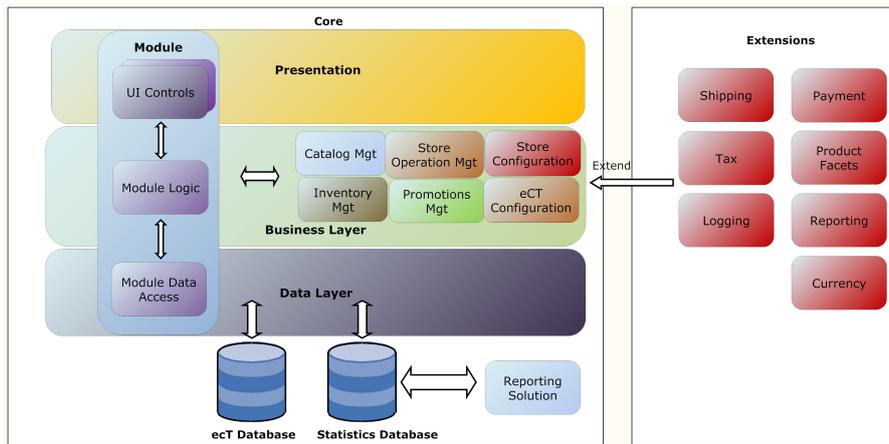


Figure 2: Overview of the eCT's architectural features.

allow the sale of fine arts originals by defining a facet "Fine arts original", that allows the association of this information (author, materials, dimensions, etc) to the product. This model allows the association of various facets to a product, allowing the composition of facets to enrich it.

In addition of the physical products (books, clothes, etc.) supported by these extensions, the eCT supports also the providing of services, that differ from physical products in the sense that providing a service does not result in ownership, but results in some benefit to the customer. Examples of this can be found at tourism, entertainment, or cultural services.

3.3 e-Commerce Models

An important aspect of the eCT is its support for different business models, so that it can be applied to different domains and business contexts, namely (1) Store; (2) Shopping Mall; and (3) Shopping Mall with integrated shopping cart. According the "Store" model, the WebComfort portal should support only one store; according the "Shopping mall" model, the portal should support a set of independent stores, that manage their own specificities (catalog, orders and payments management); and according the "Shopping Mall with integrated shopping cart" model, stores are not totally independent, and should share the orders and payment management features (see Figure 3).

3.4 Payment, shipping and taxing methods

The adaptation to different contexts mainly concerns the support of different payment, shipping and tax-



Figure 3: e-Commerce Models Comparison.

ing methods. This is essential, because it is important to supply methods that fulfill the needs of different stores. To achieve this, it is important to allow the definition of new methods and the easy integration of these methods into the eCT. (Due to space restrictions other issues are not discussed here and the reader can consult (Baptista, 2008))

4 DISCUSSION

The majority of the aspects presented above are responsible for allowing the eCT to be a flexible extension for the WebComfort platform. Even maintaining the WebComfort approach of trying to keep as few dependencies between components as possible, namely dependencies between the eCT and the WebComfort platform and between the different components of the extension.

To support the identified requirements – adaptability to different contexts; extensibility; and ease of installation and configuration – a set of inter-related features were defined: the product facet model; the support to different e-commerce models; and the adaptation to different contexts in terms of payment, shipping and taxing methods.

To implement the product facet model we adopted the Decorator design pattern, that allows to add responsibilities to individual objects dynamically and transparently (Gamma et al., 1995). This way, instead of trying to support from scratch all the expected product features in a complex class, it is now possible to define a relatively simple class and add features incrementally with decorators, being the final product the sum of all these facets. Consequently, this pattern allows the definition of a vast number of extensions (facets), that materialize specific product semantics.

Regarding the behavior that allows the adaptation to different contexts in terms of payment, shipping and taxing methods options we opted for the Provider Model (Rob Howard, 2004), that is a mix of the Abstract Factory, Strategy and Singleton patterns (Gamma et al., 1995). In the eCT, this allowed the definition of an API that exposes the operations relative to the payment, shipping and taxing areas (as illustrated in Figure 4). For instance, the Payment API can have a method responsible for processing a payment, that contains no business logic; instead it simply forwards this call to the configured provider. The providers implement different payment methods, containing whatever business logic they require. Thus, custom providers for each of these services can be easily and independently developed and configured.

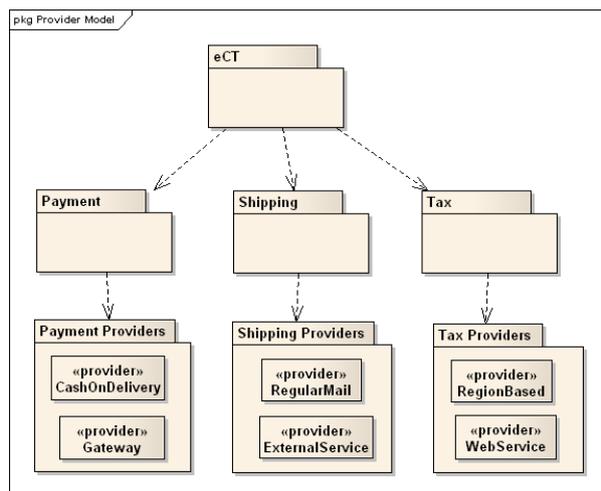


Figure 4: Overview of the provider model for payment, shipping and taxing.

5 CONCLUSION

Nowadays organizations and enterprises are using electronic channels to manage and publish digital contents as well as sell their products or services.

In the context of our research, the e-Commerce Toolkit (eCT) was implemented, to support different kinds of electronic shops, either offering products from a single entity or from multiple individual stores (electronic shopping mall).

This paper presented and discussed some of the main features of the eCT, namely: the product facet model; the supported B2C e-commerce models; and the adaptation to different contexts in terms of payment, shipping and taxing methods.

For future work we plan to improve this toolkit, mainly in the areas of promotions and inventory, that do not yet have all the expected features, and to develop more Product Facets and more providers so that we can support a greater number of different contexts.

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