

Personalized Content Syndication in a Preference World

Werner Kießling, Wolf-Tilo Balke, Matthias Wagner

Chair of Database and Information Systems, University of Augsburg, Germany

{kiessling,balke,wagner}@informatik.uni-augsburg.de

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Abstract

Personalization, which will be a key success factor for forthcoming XML-based Web standards like ebXML or MPEG-7, needs a powerful framework for preferences. The research program "It's a Preference World" at the University of Augsburg treats preferences as first class citizens in personalized e-services. Based on a rich theory of preferences modeled as partial orders we are developing enabling technologies for personalized client and middleware components. In this positional paper we sketch an architecture for content syndication in such a Preference World.

1 Introduction to "It's a Preference World"

In today's information society the need for personalized informations goes far beyond the mere storage and access of digital content or media via traditional database systems. Recent standardization efforts like ebXML [9] and MPEG-7 [5] leave open, how personalization should be dealt with. Personalization is strongly related to the notion of preferences which are ubiquitous in real life and in e-services, e.g. customer preferences or vendor preferences in B2C and B2B, delivery preferences depending on mobile client devices, etc. Such preferences come in a variety of flavors, including hard and soft selection constraints. We have already developed a theory of complex preference types (which has a solid model theory and fixpoint theory [8]). Preferences are modeled intuitively by partial orders ("I like A better than B"). Existing efficient implementations are the commercial product Preference SQL [1] for the SQL world and our recent prototype Preference XPATH [6] for the XML world. Other contributions of "It's a Preference World" concern advanced multimedia search technology [3], XSLT-based mobile content delivery for WAP and I-mode [10] and novel client interfaces including a smart e-sales person with dynamically generated speech output [7].

In the sequel we will elaborate how the architecture of a content syndication service may look like in a Preference World. We will discuss a suitable architecture for the incorporation of preferences in the process of synthesizing and syndicating personalized content.

2 Preference-driven content synthesis and syndication

Modern content brokers have to retrieve, assemble and deliver information from a variety of sources with respect to specific user's needs onto a variety of (sometimes mobile) devices. The most important steps in this process are the synthesis of documents followed by a suitable syndication. The quality of the content delivered and the value added strongly depends on an adequate architecture incorporating user profiles, preferences and technical constraints. The information sources in general are not limited to relational databases, image archives or document repositories, but more sophisticated systems also allow predefined services or external Web data to be directly integrated into query result sets [2]. In general the ideal goal is 'just in time' information, retrieved and assembled as needed, freely accessible and exchangeable across diverse systems.

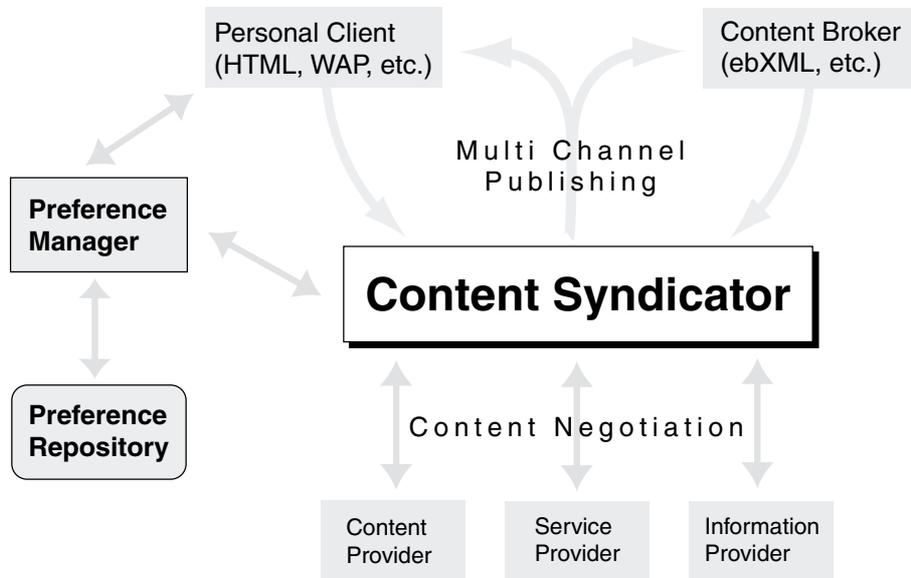


Figure 1: Content syndication in a Preference World.

Figure 1 shows our view of the main tasks in the synthesis and syndication of digital content. A content syndicator compiles information from various data sources. Depending on the user's information needs the necessary content has to be negotiated with different providers or content brokers. User's needs in our view can be most intuitively be specified by stating preferences. All preferences can be stored in a special repository and are administered by a preference manager. The preference manager has not only to select all suitable preferences for each request, but also has to keep track of user behavior and update their preferences adequately. Finally the syndicated content has to be published to either an end user or may serve as a source for further syndication.

As we have seen, when syndicating media and contents different user profiles have to be taken into account. These user profiles can be determined using different kinds of preferences:

- Customer Preferences specify what content is needed to answer queries.
- Expert Preferences specify how the content may be assembled.
- Delivery Preferences consisting of technical constraints are used to deliver the formatted content to a user's preferred device or a content broker.

Customer Preferences

Customer preferences are used to express the user's intention. They typically reflect the user's interests. Generally customer preferences can be modeled as partial orders. The user may strongly prefer some terms over others, but may be quite indecisive between some of them. Thus the benefit of using partial instead of total orders is that preferences can be expressed most intuitively. Consider for instance a highly personalized news service: Typical customer preferences would specify topics, e.g. a sample user is especially interested in the stock market news. Her/his preferences focus on the financial sector, where news from the New York Stock Exchange (NYSE) are rated higher than those from the Frankfurt Stock Exchange (FSE) and news from the banking sector is considered more important than those from the insurance sector. However, in this case market places and economy sectors remain incomparable. Best matches obviously would be banking news from NYSE followed by insurance news from NYSE and banking news from FSE which cannot be distinguished in the ranking order. All of these are considered more relevant than insurance news from FSE.

Expert Preferences

Expert preferences model internal relationships or knowledge of the application domain. They may be mainly heuristics like "Do not consider articles with stock purchase recommendations, but without any chart analysis" or

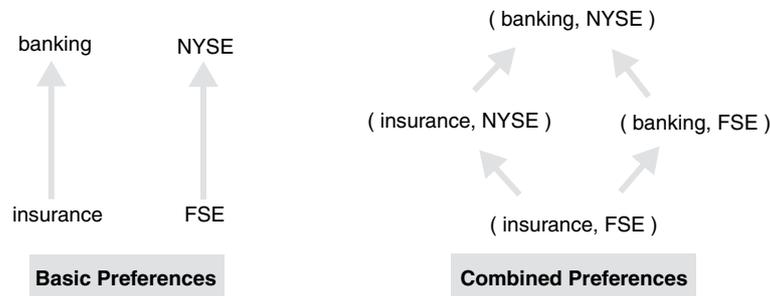


Figure 2: Sample customer preferences.

be technical as e.g. prefer articles with stock charts or most recent articles in any sector. In e-commerce applications a specific type of expert preferences is a Vendor Preference. The Vendor Preference might be used to influence customer behavior and customer buying patterns. If for instance there are several products satisfying the customer's preferences a product which is high on stock may be offered in the first place.

Delivery Preferences

The delivery profile closes the gap between content synthesis on one hand and the end user on the other. It mainly consists of platform-specific and general technical constraints. XML is becoming the standard platform for Internet services and applications. Emerging formats like MPEG-7, XHTML or WAP are XML-based. Multi-channel publishing can be implemented using the syndicated XML document and adequate XSLT transformations. Since different application areas generally rely on particular technical XML formats, also specific variations as e.g. ebXML have been proposed and standardized.

Consider a mobile user accessing stock market news from our news services using a PDA such as a Palmpilot or a handheld PC. Depending on the technical characteristics of the device, e.g. type of display, memory size or network bandwidth, content is tailored to suit the mobile user's needs. In our example a news article on banking from the NYSE might be transformed to a mobile format featuring only an abstract of the text and a monochrome stock chart.

3 Summary and outlook

We have sketched our research program "It's a Preference World" that assigns preferences a first class role for the personalization of e-services. Evidence gathered from academic case studies and from commercial experience support our claim that preferences modeled as partial orders are a proper choice for the personalization of e-services. For such a Preference World we have outlined the architecture of a personalized content syndication service with multi-channel publishing. We proposed an architecture for the direct integration of preferences into content syndication engines. Using Customer, Expert and Delivery Preferences the syndication engine negotiates the content with a variety of content, service or information providers. Due to the customer preferences the content thus is tailored to the specific user's needs, while expert preferences assure that only sensible information is compiled. Finally the delivery profile determines the most suitable way to publish the content within the limitations of technical constraints.

Our ongoing research program "It's a Preference World" aims to provide powerful and flexible XML/Java-based personalization technologies for universal content search and delivery. For instance, we are developing personalized client interfaces including e-negotiation capabilities. As part of a personalized multimedia middleware we are investigating the issue of a preference repository including preference mining techniques [4], search technologies supporting multi-objective optimizations, XSLT / Preference XPATH-based mobile content delivery and autonomous e-agent technology. This whole technology portfolio aims to support a vast variety of e-service applications.

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