A Meta-service for Event Notification

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Abstract. The integration of event information from diverse event notification sources is, as with meta-searching over heterogeneous search engines, a challenging task. Due to the complexity of event filter languages, known solutions for heterogeneous searching cannot be applied for event notification. In this paper, we propose the concept and design of a Meta Service for Event Notification. We define transformation rules for exchanging event filter definitions and event notifications between various event services and sources. We transform each filter defined at a meta-service into a filter expressed in the language of each event notification source. Due to unavoidable asymmetry in the semantics of different languages, some superfluous information may be delivered to the meta-service. These notifications are then post-processed to reduce the number of spurious messages. We present a survey and classification of filter languages for event notification, which serves as basis for the transformation rules. The proposed rules are implemented in a prototype transformation module for a Meta Service for Event Notification.

1 Introduction

Alerting Services or Event Notification Services (ENS) inform their users about changes that have occurred at information objects. These changes are called events. Information objects can be, e.g., documents in a digital library or temperature sensors in a facility management system; events can be caused, e.g., by new, changed or deleted objects. The service actively or passively observes the information objects at the providers sites (e.g., documents in digital libraries or sensors in buildings). Users describe their interest in form of personal profiles that define filter conditions for the information delivery. In a widely distributed application context, each of the considered applications may employ their own alerting services (e.g., as done for digital libraries provided by different publishing houses or as currently available for tourist information). Users on the other hand, are interested in combined information from diverse and heterogeneous sources. Similar to the problem of information querying over widely distributed information sources, here we encounter the problem of distributed filtering over heterogeneous event sources.

Unfortunately, the results known from research in meta-searching [12] and query rewriting for search over heterogeneous sources [3,21] cannot simply be applied to the new context of event notification. Advanced filter conditions are more complex than search queries; in fact, they can be seen as extensions of search queries: A simple filter expression can be seen as a standing search query. Additionally, filter expressions can contain sophisticated event pattern descriptions referring to temporal succession of events, such as sequences and disjunction of events [11,19,20].
1.1 Problem Statement and Contribution of the Paper

The existence of several independent event notification services causes a number of problems, see Figure 1(a) for illustration:

1. Subscribers are forced to subscribe the same profile to a number of services; these use different filter languages (i.e., the profiles have to be expressed differently) with differing expressiveness. In Figure 1(a) the large number of dashed arrows from each subscriber indicates the repeated subscriptions.

2. Composite events combining events from different providers that are handled by different services cannot be directly subscribed to. In consequence, the client has to subscribe to (several) separate services and implement post-filtering locally. In Figure 1(a) the arrows from each ENS indicate the notifications that have to be post-filtered at the subscribers’ sides.

3. If providers serve several services, the duplicates have to be removed in a post-filter process at the client side. In Figure 1(a) the postfiltering is depicted as boxes at the subscribers’ sides.

An umbrella service could combine all providers but would force a flat homogenization of the providers, while ignoring the existing heterogeneity of the providers and services. Moreover, there are the issues of trust, downwards compatibility, company strategy, and required integration of legacy systems.

As a solution to the three problems we propose the equivalent of a Meta-Search Engine: a Meta Event Notification Service (Meta-ENS), see Figure 1(b). Our solution allows for and supports the heterogeneity of services and providers. It integrates services while accepting their differences and diversity. The advantages are evident: Subscribers can have a uniform access for profile definition, having access to several event sources. Users are not repeatedly notified about the same event, i.e., duplicate recognition can be implemented on the meta-service level. In addition, security and privacy issues are