Increasing the Usage of Open Hypermedia Systems: A Developer-Side Approach

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ABSTRACT

This paper argues that the existence of a developer support framework is a critical issue to the usage of Open Hypermedia Systems (OHSs). For this reason, the OHS Community would benefit by the adoption of both a service discovery mechanism and a set of standards and tools to approach the development of hypermedia clients in a transparent and methodological manner.

Categories and Subject Descriptors

H.5.4 [**Hypertext/Hypermedia**]: Architectures.

General Terms

Design, Standardization.

Keywords

Open Hypermedia Systems, Hypermedia Services, Service Discovery, Web Services, Developer Support.

1. INTRODUCTION

During the past few years, Open Hypermedia Systems (OHSs) have reached a satisfactory level of the provision of hypermedia services. Most of the OHSs can provide a wide set of services in a stable way. However, as it has been pointed out [5], the usage of hypermedia systems and services is narrow and has failed to reach a considerable number of people.

In order to solve this problem, Open Hypermedia community focused on integration methods between OHSs and third party applications and other widely accepted hypermedia systems like World Wide Web (WWW) [1]. Moreover, Open Hypermedia System Working Group (OHSWG) moved on the definition of Open Hypermedia Protocol (OHP) [6], so as to address interoperability issues amongst hypermedia systems. Currently some interesting implementations for developer support (like the Construct developer framework [9]) have been introduced, that focus on building server-side hypermedia components. Nevertheless, the promoted research towards OHS usage has not yet fully approached the developer's client side requirements.

In this paper we emphasize on the need for revisiting the general hypermedia architecture from a developer side's perspective. In particular, it is argued that developer's requirements dealing with the systematic creation of hypermedia client applications should be taken into consideration when building hypermedia systems.

2. THE NEED FOR DEVELOPER'S SUPPORT

During our last research [3], we had observed two critical issues that should be fully researched from the OHS community: a) the need for a service discovery mechanism and b) the need to address the hypermedia client development problem in a methodological way during design time. Both issues are ultimately based on the level of *introspection capabilities* a hypermedia system can exhibit: i.e. to be aware of all provided hypermedia services.

The provision of a taxonomic hypermedia service (Babylon server [3]) to the WWW through a Web Service implementation gave us the opportunity to approach the OHS from the developer's perspective. Our goal is to answer the question: "*how can the level of hypermedia systems be raised so as to facilitate developers in integrating hypermedia services into their applications ?*"

3. EXTENDING OHSs CAPABILITIES

When a developer intends to add hypermedia functionality to his application, he usually follows certain steps. In particular, he: a) searches for the appropriate hypermedia server through the network, b) understands the server interface and the way the server operates, c) implements the required communication level into the application in order to communicate with the server and d) encapsulates the adopted service as a set of functions added into his application. Based on the above observation, the next two important issues arise.

3.1 Service Discovery

We define the term hypermedia service discovery as the procedure of searching through the network, locating the suitable hypermedia service and finally acquiring the needed information of how to use this service (i.e. service description information).

Many researchers mentioned the need of a service discovery into OHSs' area. The designing of Component Based Open Hypermedia Systems (CB-OHSs), where multiple structure servers exist, has strengthen the need for a server discovery system. Towards this, implementations like the Server Information Management (SIM) servers [4] and the notion of

Hypermedia Resource Descriptors (HRD) [7] have been proposed. On the other hand, common architectures like Web Services and CORBA use a global registry Mechanism (Universal Description, Discovery and Integration of Web Services - UDDI) [8] and an internal naming and discovery mechanism respectively. Our research shows that the following factors should be first addressed in order to design a stable and usable hypermedia service discovery system:

1. Hypermedia services should be self-described services using an appropriate language. The use of XML seems promising since it allows service definition, understandable for both humans and computers.

2. A special purpose service that holds information of available services should be created. This server could operate as a global registry or as a member of a distributed DNS like service discovery system. Moreover, this mechanism could be useful in a peer-to-peer environment, in order to increase the search performance (a P2P Hypermedia approach has been presented in [2]).

3. For each hypermedia server, a server registration procedure should be followed.

4. A simple service query protocol based on a common used communication protocol should be defined.

Based on the existence of many mature search mechanisms, the OHS community should either adopt one of those or create a hypermedia-specific service discovery mechanism that will encapsulate a set of existing features.

3.2 Improvement on developer's support
The rapid usage of the Web Services shows that the focus is shifting from ad-hoc and standalone tools to sophisticated developer platforms. This observation in conjunction with the related OHSs work extracts a set of critical issues on developer support on OHSs.

1. Tools for exploring the available services of a particular hypermedia system should be provided. Such facilities would allow both browsing and querying the global registry, thus allowing developers to gain a global view of a system. The global view contributes to the understandability of the entire hypermedia system.

2. The developer should not worry about the communication protocol that has to be used in order to communicate with a server. Therefore, approaches that utilize widely accepted communication infrastructures such as Simple Object Access Protocol (SOAP) should be accepted or the ability of dynamically locating and loading protocols –at run time - should be investigated. Such dynamic behavior can already be witnessed in applications such as browsers and video players that automatically download plug-ins.

3. Tools for automating generation of client communication layer should be developed. In addition, such tools should be available for a wide range of devices and platforms.

4. CHALLENGES
The main challenge in OHSs is the introduction of introspection capabilities, upon which service discovery mechanisms and sophisticated development environments can be build. In particular, description languages and protocols that implement such introspection capabilities should be explicitly presented. Currently, a prototypic implementation of introspection capabilities is evaluated within the framework of the Babylon System with promising results for developers.

5. CONCLUSIONS
Rethinking the design of hypermedia systems from the developer's perspective, achieves a growth of OHSs usage. The ad-hoc integrations between OHSs and third party applications are not solving current problems sufficiently. On the contrary, giving developers capabilities of discovering, examining and using hypermedia services in the context of developing hypermedia clients can raise the level of openness in OHSs.

6. ACKNOWLEDGMENTS

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