Requirements Architecture for Creating Mash-ups in Higher Education

Rabiu Ibrahim
Fasaha International
No. 167 Haruna Kassim Street
Kanti quarters, Ringim Jigawa, Nigeria
brancy@gmail.com

Shamsiyya Adam Muhammad
Fasaha International
No. 167 Haruna Kassim Street
Kanti quarters, Ringim Jigawa, Nigeria
shamsiyyamadam@gmail.com

Abstract—**There has been much research which has focused on developing architectures. This has taken place in many fields, including the information technology and information systems areas, such the Web, yet there is no evidence that architecture for Mash-up development exists. Additionally no evidence shows that architecture for Mash-up in Higher Education exists. Looking at Mash-up growth across many fields, this research perceives that there is a need for architecture to define the role and responsibilities in Mash-up development specifically in Higher Education. A layered architecture would seem to be appropriate. This research proposed Requirements Architecture for Creating Mash-ups in Higher Education**

Keywords— Mash-up, Architecture, web 2.0, Higher Education

I. INTRODUCTION

Much research has focused on developing architectures for web 2.0 and the semantic web. An example of such architecture is the research entitled "semantic web architecture: stack or two towers?" There are quite a number of other studies which focus on the development of an architecture for web 2.0 as well as for the semantic web.

The study in [1] states that so far it has been broadly recognized that architecture for the semantic web depends on the hierarchy of languages, each language having certain characteristics, which poses challenges for the creation of a layered architecture.

Meanwhile, another study of web 2.0 [2] states that current Web architectures stress the scalability of element connections, the generality of connects, the independent deployment of components, the intermediary components used to lessen interaction latency, security enforcement, and the encapsulation of legacy systems. With all the above, the authors come to the conclusion that a Requirements Architecture for Mash-up development is needed.

A Mash-up is understood to be "a web site or application that utilizes and combines data, presentation or functionality from several sources to produce new services" [3].

Mash-ups are web 2.0 programs that reuse pre-existing data and services on the internet, reconstituting these to create new programs in a rapid, ad-hoc manner [4], [5].

A. Research focus

Mash-ups have assumed greater prominence because of the growing amounts of people and organizations utilizing Mash-up technology [6], [7].

Surprisingly, in view of the great interest in Mash-ups, one can find few references discussing an effective development methodology or process for HE Mash-ups.

This study thus tries to create architecture for Mash-up development in higher education (HE).

B. Problem

Due to a lack of methods that best describe the needs at the different levels, from the user perspective, many HE environments have diverse systems of information and this diversity may create issues in terms of data integrity across the HE environment.

A number of studies have analyzed the problems of data integration in HE. One study mentions how IT managers are failing to make successful integration in HE [8]; a second raises concerns in relation to the integration [9]; a third emphasizes the need for an integrated information system in HE and states the associated issues [10], whilst another focuses on the foundation and strategic planning needed to implement data integration [11].

C. Aim

The primary goal of the paper is to suggest requirements architecture for Mash-up development to aid in its implementation and application in the HE context.

II. REQUIREMENTS ARCHITECTURE FOR CREATING MASH-UPS

After considering an existing architecture, i.e. the enterprise Mash-up architecture [12], the current research sees the need to create a new architecture in order to enhance and standardize Mash-up development.

This section of the paper describes the proposed requirements architecture used in the generation and creation of Mash-up applications; it uses three different levels and their respective roles in the creation of a Mash-up are described.

The new architecture divides the process into three layers: the Resource Layer, the Widget Layer, as well as the Mash-up Layer, as shown in Figure 1.
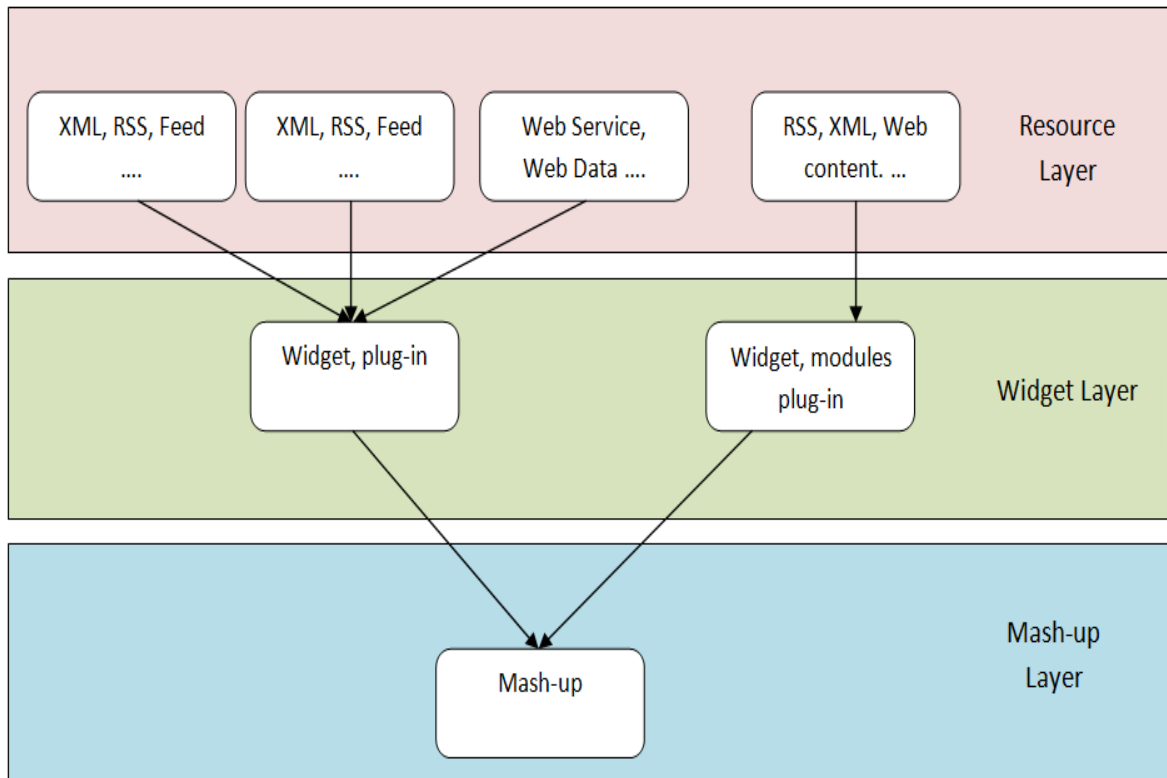

Figure 1.Proposed requirements architecture for Mash-up development

This section highlights basic details of Mash-up development and identifies the roles of the person(s) involved in this process.

When studying the previous enterprise architecture it was felt that there was a need to define clear roles and responsibilities and the level of each role. The newly created architecture includes these role definitions.

Below is a more detailed description of the process, roles and responsibilities inherent in the proposed architecture.

The architecture is layered and in each layer there are different activities, roles, and responsibilities.

A. *Architecture Layers are as follows :*

- The start level is the Resource Layer. It provides the main platform and the basics for building Mash-ups. The item to be mashed-up can be in the form of a data source or a functional process and, typically, the content in this layer is generated by the website developer, webmaster, or individual(s) with a development background or having programming skills. Contact with the content provider must be made.

- The Widget Layer is at the second level in this architecture, and is concerned with operations such as filtering out some source elements from larger sets of data elements. The component used in this layer generally processes the content that is generated from the layer at the first level. The requirement is for an understanding of task support and application-oriented functionality. Expert users or consultants are the people in charge of creating and generating content in this layer of the architecture. This is because they know the application domain to which the widget is to be employed.

- The Mash-up Layer is the lowest level, or third layer, in this architecture. The process involves consuming the content from the previous layer and transforming it so as to develop a Mash-up at this lowest level. Development in this layer is done by the end user, as it does not require any programming skills. This task is based on the usage of a visual interface.

B. *The roles in this architecture could be stated as follows:*

- The Developer's role in the resource layer is to program the resource components and content, and may require the use of dedicated programming tools.

- The Expert user's role in the widget layer is: to generate content from one or more sources; to create a widget from the generated resource; and to state the parameters in the widget that are to be used by the end user in the next layer.

- The End User's role in the Mash-up layer is to make use of the widget created by the expert user in the previous layer, and create a Mash-up from it by connecting the widget, using a visual interface.

III. DISCUSSION

At the commencement of this research there existed a single Mash-up architecture, entitled "the enterprise Mash-up architecture." This study has created more comprehensive requirements architecture for Mash-up development in HE.

In contrast to the enterprise Mash-up architecture, this study has created a layered architecture by "drilling down" and elaborating the roles and duties/responsibilities of the relevant individuals.

Following the stages in this requirements architecture carefully and thoroughly will help to ensure success in the development of a Mash-up.

IV. CONCLUSION

This paper provides a partial solution to the task of Mash-up development and application by introducing a novel requirements architecture. Usage of this architecture has been made and there is clear evidence of its impact.

V. FUTURE WORK

For this research, a number of candidate Mash-up editors were considered. However, only one editor was chosen.

Yahoo! Pipes is the Mash-up editor used in this research. The future plan of this study is the creation of a new Mash-up editor, one that will best address the issues appertaining to the HE context.

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