Wiki as Business Application Platform: The MES Showcase

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ABSTRACT

This presentation shows the business application suite mHub that implements the core components of a manufacturing execution system (MES) purely with a specially developed application wiki distribution. The novelty of the application wiki is its "wiki as business application platform" approach, that abstracts all necessary technologies to implement the solution within the edit page area. Other than application wikis targeted for end users, that merely serve as query interfaces to existing business applications, this application wiki enables developers to script every aspect of the application domain within the wiki itself.

Categories and Subject Descriptors

D.2.3 [**Coding Tools and Techniques**]: [Object-oriented programming]; D.2.m [**Miscellaneous**]: [Rapid Prototyping]; D.2.6 [**Programming Environments**]: [Integrated environments]; H.5.4 [**Hypertext/Hypermedia**]: [Architectures]; J.1 [**Administrative Data Processing**]: [Business]; I.2.1 [**Applications and Expert Systems**]: [Industrial automation]

General Terms

Design, Human Factors, Languages, Documentation

Keywords

Application wikis, software engineering, collaborative software development, rapid application development, Web IDE, manufacturing automation and control, ERP, MES

1. INTRODUCTION

Application wikis are currently used to empower end users for one-off computational tasks and "can be viewed as a variant of today's mashup platforms" [3]. They enable users to embed queries to other business application platforms like SAP [1]. Therefore those business application platforms can be documented and queried with a wiki engine. However the main idea of "literate programming" - described in the context of wikis by Xiao, Chi and Yang [7] - is not achievable with such simple application wikis. To adhere to this idea, documentation and code must be combined to describe the application domain in a holistic way. To achieve this goal, wikis need to become application platforms themselves. They should not merely serve as add-ons to existing business suites, but enable application stakeholders to use the wiki design principles [2] in every aspect of the application development cycle. We have developed an application wiki distribution that provides such a business application platform, which does not depend on other platforms, to implement a domain specific information system. For lack of better term we call this kind of wiki "business application platform wiki" - or BAP Wiki, to distinguish it from more simple application wikis.

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2. MES AS PROOF OF CONCEPT

The developed product called mHub [5] is an application suite with the strategic goal of implementing a reliable, purely web based system for manufacturing execution and control (MES). The requirements in this application domain are demanding and thus their fulfillment served us as proof of concept for the "wiki as business application platform" idea. The term MES is classified by the ISA level model as described in Trevathan et al. [6]. It is arranging the software components for the manufacturing industry into layers. On top the planning layer is represented by enterprise resource planning systems (ERP). On the lowest level, the automation layer describes the components that are directly programming and communicating with devices in the shop floor, like machines, robots and automated transportation systems. On the middle tier are the MES components. The MES components get order data from the ERP tier and directly communicate with workers and automation systems. In addition the MES components record state data for personnel, machines and orders and combine such data to a process history. Such process history serves the company as a basis to an improvement cycle for accurate product costing and better future planning.

3. REQUIRED PLATFORM FEATURES

To implement MES components, a variety of user interface and hardware types must be supported. Examples for user interface types are desktop, tablet, and mobile clients. High level drivers need to be developed to interface with specialized hardware like programmable logical controllers (PLC), barcode and smartcard readers. The programming for the MES domain was done entirely in the browser within the

edit page area of the wiki. To achieve this goal, our BAP Wiki creates a self containing, object oriented abstraction layer that makes all aspects of the system scriptable in wiki markup. To create this abstraction layer the following components where developed as an essential part of the wiki engine:

- Server side JavaScript definition in so called "logic pages" (similar to talk pages, creating "rich pages" [7])
- A library system that allows inclusion of scripts.
- Embedded SQL queries, an active record implementation and a SOA interface
- User interface widgets that interact with an event mechanism called "wiki actions"
- An enterprise scheduler system that calls "wiki actions"
- Business intelligence components: chart extensions, report generator integration and a cube definition syntax for active record
- A hardware device interface library that enables interactions with the event mechanism
- An extension mechanism that allows creation of scriptable objects written in a "system level" language.

4. SYSTEM DESIGN PRINCIPLES

Figure 1 visualizes the conceptual layers of our BAP Wiki. The top level is unique to the wiki way and provides a new paradigm for the human augmentation system [4] that better suites our way of collective thinking. I call it the mind map metaphor. Developers think of wiki pages as concepts, that not only contain the documentation of those concepts but also encode the behavior of them in logic pages - a kind of object oriented programming where the wiki page within a convergent namespace becomes the unified, precise "class". Developers in the same domain can stumble upon concepts already designed by others, observe and incrementally improve them.

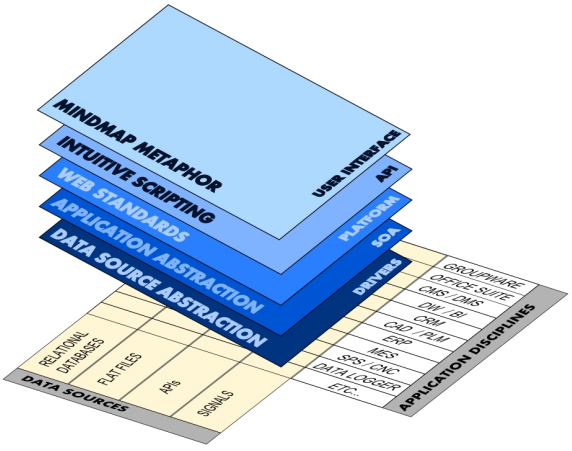

Figure 1: Concept layers of a BAP Wiki

5. REAL WORLD EXPERIENCE

We replaced several MES level applications with mHub products. The applications we replaced performed poorly, proved to be unreliable and were very labor intensive to operate. The implementation with mHub, based on our BAP Wiki, resulted in stable systems for this unforgiving environment of industrial production. The mHub solution, compared with the previous implementations, led to impressive performance in production: Over 100 machines deliver production signals every three seconds on average, interfacing with more than 30 production worker terminals, experience no downtime and fast response times (the system has been in production for over a year). We have similar experiences with other clients although their requirements differed. The BAP Wiki scripting allowed us to adapt to these different customer environments rapidly.

6. CONCLUSION

The mHub business application suite proves that a BAP Wiki works well in practice. BAP Wikis pursue a more demanding goal compared to the current application wiki approach: They should be suited for rapid implementation of all aspects of complex business information systems following the "literate programming" ideal. However while application wikis currently enable end user programming, our system still requires professional developers. Developers gain advantage over the traditional application platform approach through speed advantages caused by the new abstraction level and by maintaining the wiki concept of collaborative work. The mHub experience shows that BAP Wikis are an alternative to the slowly adapting "standard software" and application platforms that depend upon their data structures.

7. REFERENCES

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