Chapter 2.15
Alerts in Healthcare Applications:
Process and Data Integration

Dickson K.W. Chiu
Dickson Computer Systems, Hong Kong

Benny W. C. Kwok
The Chinese University of Hong Kong, Hong Kong

Ray L. S. Wong
The Chinese University of Hong Kong, Hong Kong

Marina Kafeza
University Hospital of Heraklion, Greece

S.C. Cheung
Hong Kong University of Science and Technology, Hong Kong

Eleanna Kafeza
Athens University of Economics and Business, Greece

Patrick C.K. Hung
University of Ontario Institute of Technology, Canada

ABSTRACT

Urgent requests and critical messages in healthcare applications must be delivered and handled timely instead of in an ad-hoc manner for most current systems. Therefore, we extend a sophisticated alert management system (AMS) to handle process and data integration in healthcare chain workflow management under urgency constraints. Alerts are associated with healthcare tasks to capture the parameters for their routing and urgency requirements in order to match them with the specialties of healthcare personnel or the functionalities of Web Services providers. Monitoring is essential to ensure the timeliness and availability of services as well as to ensure the identification of exceptions. We outline our implementation framework with Web Services for the communications among healthcare service providers together with mobile devices for medical professionals. We demonstrate the applicability of our approach with a prototype medical house-call system (MHCS) and evaluate our approach with medical professionals and various stakeholders.

INTRODUCTION

Recent advances in Internet technologies have created a global platform for organizations and individuals to communicate with one another, carry out various commercial activities, and provide value-added services. Web Services (Chiu et al., 2003) provide loosely-coupled standard interfaces among autonomous systems within and among organizations in the form of a set of well-defined functions for both programming and human user interfaces. Web Services further support event-driven information integration for timely service provision and interactions (Chiu et al., 2004). In healthcare chain workflow management, both process integration and data integration among health service providers are vital. Besides organizations, individual practitioners (such as physicians and nurses), administrators, and patients are also involved heavily in the workflows. Tasks like medication monitoring, emergency hospitalization of patients, laboratory examination results, shipment of drugs, exchange of patient records among healthcare service providers, etc., produce large numbers of messages. That is, both process integration and data integration are necessary. Further, accurate and timely communication of such information is a key success factor for the provision of quality healthcare chain services. We refer to these urgent messages as *alerts* (Kafeza et al., 2004).

Existing practice of using cellular phones and pagers for communications is inadequate for seamless integration with existing and future healthcare information systems. In particular, healthcare applications must respond actively and timely to patients' needs as this is crucial to life or death. Most healthcare alerts have to be handled within a time period. Apart from service suitability, application specific considerations like costs, waiting time and service time may also be important. Routing, monitoring, and logging the alerts are also mandatory functionalities to shift the burden of these communications from the manual work to an automated system. To take advantage of the connected Internet environment, we extend an alert management system (AMS) for healthcare professionals (Kafeza et al., 2004) across organizational boundaries to become the key mechanism for both healthcare process and data integration with urgency support. The AMS aims to minimize delays by providing a monitoring system. This article generalizes and extends our previous work on workflow modeling (Chiu et al., 1999) and process integration (Chiu et al., 2004) in order to be applied in healthcare applications.

As compared with our previous work (Kafeza et al., 2004), the contributions of this article are the description and analysis of the following: (i) an enhanced conceptual model for specifying alerts based on the requirements of healthcare chain workflow management, which supports programmatic interfaces across organizational boundaries in additional to human users; (ii) alerts as a unified mechanism for capturing the requirements of healthcare process and data integration; (iii) a practical architecture for the AMS based on contemporary Web Services for programmatic interactions, together with multiple-platform support for human users; (iv) a practical prototype Medical House-Call System (MHCS) to demonstrate the applicability of our approach in healthcare chain workflow management.

In order to reach these objectives, we first discuss an overview of our methodology and the overview of a MHCS and compare related work. Then, we describe our system design and implementation as well as how data and process integration works in our system with a typical system walkthrough. Finally, we discuss the advantage of our alert-driven approach before concluding our article with our future work direction.

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