

## Collaboration Service Integration Platform Using Context-Aware Role-Based Access Model

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**Abstract.** The effective business process management has received attention recently for improving business process performance and supporting coordination scenarios in collaboration platform. However, the user and role authorities in the existed collaboration platform cannot automatically change in accordance with time and location. Since handling processes with tasks and data separated by enterprise boundaries is hard, this study presents the Collaboration Service Integration Platform (CSIP) on the basis of the standard Business Process Model and Notation (BPMN) and Context-Aware RBAC (CA-RBAC) model. CSIP is not only to narrow the gap in the existed popular collaboration platform such as workflow process limitations but also to satisfy the increasing needs on the different contextual attributes.

**Keywords:** Access Control Model; Business Process Model and Notification; Role-Based Access Control

### 1 Introduction

With the globalization of markets, firms have struggled to achieve greater collaboration to leverage the knowledge and resources [1]. The effective management of an organization's business processes, as a result, became ever more important [2]. Fundamentally, business processes either private or public business processes commonly found in business organizations or inter-organizational collaboration. Well business management for a series of tasks for different workflows of jobs or processes within an organization can make production and services more efficient. Interfirm collaborations with efficient business management instruments can improve the competitiveness of companies. Handle processes with tasks and data separated by enterprise boundaries, however, is hard for process collaboration environments, for reasons such as security, privacy, etc [3].

Google Sites is a popular collaboration platform which provides highly configurable blog, Wiki and content management functions [4]. Users can create and share contents with each other on the web. A collection of group documents interactively is distributed and processed on the site. Google site can streamline workflows and allow everyone to work together. Nevertheless, Google Sites is not

ideal because of signoff without watermark, lack of workflow agent listener service, limited use of HyperText Markup Language (HTML) coding and lack of Cascading Style Sheets (CSS) incorporated in the theme templates, etc [4]. To avoid the limitations of business processes in Google Sites, this study develops collaboration service integration platform which is combined with open-source business process management and workflow suites.

To guarantee that the protected business services can only be accessed by authorized users as the specified manners in collaborative environment, access control [5] is an important authorization policy and security mechanism for organizations to protect their resources in collaborative environments. Rule-Based Access Control (RBAC) [6] model is practical and widely deployed in distinct enterprises. Furthermore, Context-Aware RBAC (CA-RBAC) [7] can involve the contextual attributes such as location and time. Therefore, this study proposes the Collaboration Service Integration Platform (CSIP) using CA-RBAC to satisfy the increasing demands on the different contextual attributes. The CSIP is based on Business Process Model and Notation (BPMN) 2.0 which is an important standard and supplied by large global software companies.

The remainder of this study is structured as follows. In Section 2 this study provides background knowledge through the description of related technologies, such as the concept of access control models. In Section 3 this study designs and implements the architecture of CSIP. Finally, conclusions and future work are given in Section 4.

## 2 Access Control Models

Previous research to specify the different access control policies has presented dozens of access control models since the late 1960s'. The research community contains Access Matrix [8], Discretionary Access Control (DAC) [9], Mandatory Access Control (MAC) [9], and RBAC [10]. While DAC and MAC appeared in the early 1970's it took another quarter century for RBAC to thrive and develop robust foundations. RBAC emerged as a result of increasing practitioner dissatisfaction with the then dominant DAC and MAC paradigms, encouraging academic research on RBAC. With the flourish of the distributed systems, RBAC models are more flexible and practical [11].

RBAC is an approach used for advanced access control to restrict system access to authorized users, and is widely deployed in distinct enterprises of all sizes to support information access management. In recent years, some extensions to the authorization as well as the administrative models for RBAC have been adopted [12].

Nevertheless, RBAC is often required to think of various context information in authorization decisions, especially in highly interactive and interconnected environments. Furthermore carry out fine grained policies where permissions are directly assigned to certain individuals in many real-world applications is necessary [13].

Devdatta Kulkarni et al. [7] proposed a CA-RBAC model for pervasive computing applications. Context identification mechanisms can be designed to

suggest proper contexts to users. The contextual attributes may involve the translation of location, time, proximity, or the executing subject. Due to the increasing demands on the different contextual attributes, this paper adopts CA-RBAC to meet and satisfy the industry needs.

### 3 The Design and Implementation of CSIP

The CSIP includes (1) users, (2) Human-Computer Interface Server (HCIS), (3) Web Service Server (WSS), (4) Content Management Server (CMS), (5) Workflow Server (WFS), (6) Database Server (DBS), (7) Authentication Server (AS), and (8) tools as shown in Figure 1.

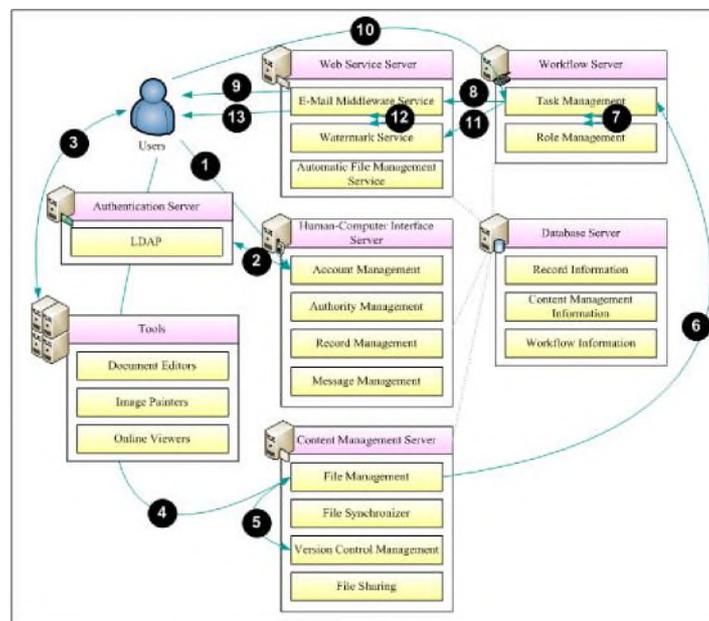


Fig. 1. The architecture of CSIP.

#### 3.1 Users

Users can utilize various terminal devices that include Personal Computer (PC), notebook, Tablet PC, Personal Digital Assistant (PDA), and smart phone to communicate with CSIP to access the information, tasks, files, etc. This study uses HyperText Markup Language (HTML) and JavaScript to design and implement the client site, so users can utilize various terminal devices to access CSIP.

### **3.2 Human-Computer Interface Server**

Users can access CSIP via HCIS which is implemented by using Play framework 1.2.4. with Model-View-Controller (MVC) model. HCIS uses Hibernate technique to build the Object Relational Mapping (ORM) and uses Groovy language to generate the view template. HCIS provides account management, authority management, record management, and message management which are presented as follows.

### **3.3 Web Service Server**

This study uses Tomcat 6.0 framework to implement the WSS and builds the web Application Programming Interfaces (APIs) based on Representational State Transfer (REST) format. The WSS includes E-mail middleware service, watermark service, and automatic file management service which are presented in following subsections.

### **3.4 Content Management Server**

The CMS is a content and resource storage center and combines with File Transfer Protocol (FTP), Web Distributed Authoring and Versioning (WebDAV), Network File System (NFS), and Content Management Interoperability Services (CMIS) for resource access. This study uses Alfresco framework which is an open-source system based MVC model to implement the CMS.

### **3.5 Workflow Server**

The business processes can be built in the WFS which is implemented by using Bonita framework 5.9.1. This study uses BPMN 2.0 to build the workflows of business process, and the workflows include pools, lanes, tasks, roles, gateways, connector, and messages. The tasks, roles, messages of task, user actions are predefined in each workflow. WFS offers task management and role management which are presented as follows.

### **3.6 Database Server**

For implementation, this study uses MySQL Server 5.5 technique to implement the DBS which includes HCIS data, CMS data, WFS data, connection module, and control module. The server also offers the web services properties to store and access, and it is a powerful application tool to provide reliable information for collaboration.

### **3.7 Authentication Server**

This study designs an AS to integrate the CSIP and the existed servers in company for single sign-on (SSO). AS is implemented with Light-weighted Data Access Protocol

(LDAP) on Ubuntu 12.04 to build the user's accounts and information. When HCIS receives the login request from user, it can send the request to AS via SSL to verify the user account.

### 3.8 Tools

The CSIP which is an open platform can provide APIs to interact with external systems and tools. The tools (e.g., document editors, image painters, and online viewers) can be embedded and built in CSIP easily for user operation.

## 4 Conclusions

Business process management is one of the most widely used methods; as a result, effective and efficient management of an organization's business processes in collaboration platform become ever more important. However, the user and role authorities in the existed collaboration platform cannot automatically change in accordance with time and location. Due to the hard diverse process handling with tasks and data separated by enterprise boundaries, this study proposes the CSIP combines the standard BPMN and CA-RBAC model to offer friendly graphical user interface and access control with contextual attributes solution in collaboration environment. The CSIP is a practical approach to satisfy the increasing demands on different workflow and contextual attributes in machine tools industry as well.

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