基于 ITIL 标准的移动变更与配置管理系统研究与实现

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ITIL-Compliant Mobility Change and Configuration Management in BlueStar

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Abstract: With the rapid growth of powerful mobile devices, to improve the speed and quality of customer service, mobilizing their workforce became more and more important to many companies. Consequently, all kinds of enterprise applications, policies and data access are enabled through mobile platforms. However, how to manage such various mobile types and mobile applications and to integrate them with existing enterprise IT infrastructure becomes a great challenge. In this paper, we propose a novel approach to manage the enterprise mobiles through IT service management by using standard ITIL processes. Motivated by real cases of insurance industry mobile solution, firstly, a system architecture named BlueStar is designed which integrated ITIL-compliant mobile management and enterprise IT service management into a uniform platform. Secondly, typical ITIL processes and best practices: Change and configuration workflow are introduced for mobility management. Thirdly, the BlueStar system included device management component is implemented and evaluated by the motivating cases.

Key words: mobility; ITIL; change management configuration management; OMA-DM

1 Introduction

The emergence and deployment of broadband wireless networks, new types of mobile phones, mobile web technologies and new applications are putting mobile to a significant enterprise facilities. In today's competitive environment, more and more mobility workforces have been equipped with mobile devices, including cellular phones, smartphones, and PDAs to enable them to stay in touch with colleagues, customers, suppliers and partners. By leveraging mobile platforms, enterprise can be more efficient and effective that improves responsiveness to customers; increase employee's productivity; streamline, integrate and automate business processes; reduce data collection time and provide new innovative mobile applications to their clients and workforce.

However, it is a big challenge to effectively deploy and manage the enterprise applications and business logic over a wide array of devices, connections and platforms. Failures to effectively tackle the mobile changes will leave companies with inefficient operations and at a major competitive disadvantage through poor customer service, higher cost of operations, and lack of flexibility. For instance, imagine a company that has not upgraded its administrative policies regarding software upgrades to meet the unique needs of mobile workers. If the company forces a manual upgrade process on the managed mobiles, leaving the question of when and where to update their mobile devices up to the employees, it will soon face the daunting challenge of managing and fixing multiple devices in various states of operational compliance. The lack of consistency can easily catch up to end users when they can least afford to have their work

mobiles malfunction.

The most important reason for such failure is that companies often do not utilize technologies that automate processes such as deploying patches or software upgrades in a way that reduces the possible errors and the amount of time in manually managing data and maintaining mobile devices by their employee. According to the related surveys, near 90% problems are caused by uncontrolled changes and field research shows that 95 percent of issues affect only a subset of users and cannot be found by looking at the infrastructure alone.

For addressing such a challenge, Information Technology Infrastructure Library (ITIL) which is a guide to the IT service management should be introduced into our mobile platform. In our current work, best-practice of ITIL-compliant change and configuration management processes will be extend to mobility. Beyond the economies of scale and efficiency, an ITIL-compliant system can benefit from one standard set of vocabulary and best practices across the entire IT organization for delivering all end-user services and technologies.

The rest of the paper is organized in four major sections. Section 2 introduces overview of our approach and the design of BlueStar architecture. Section 3 presents the implementation of the ITIL-compliant mobility configuration and change management. Section 4 introduces the related works. The last section concludes this paper and identifies future works.

2 BlueStar Architecture

BlueStar system is applied to insurance industry that support claims processing with mobiles. As discussed above, corporate IT infrastructure will have to integrate mobile devices into existing set of IT management system. Enterprise IT policies that are currently applied to desktops and laptops should keep same functions on these mobile devices. For addressing the requirements and challenges mentioned, we proposed a new infrastructure to enable smooth business process and integrated management service leveraging CCMDB Server and Device Management Server. As showed in Fig.1, the current architecture of BlueStar consists of four parts: enterprise portal, enterprise business applications, device management service and CCMDB Platform.

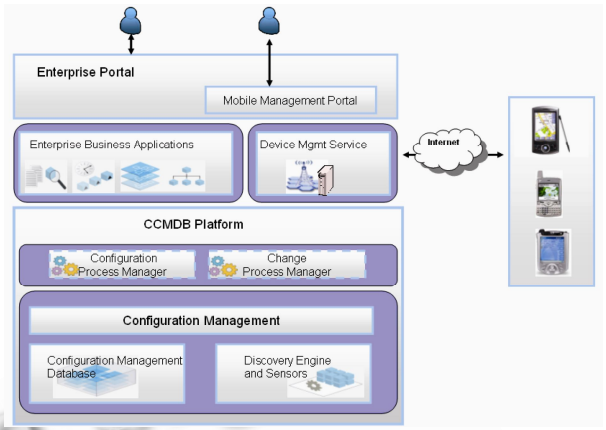

Fig.1　ITIL-compliant BlueStar architecture

2.1 CCMDB platform

Change and Configuration Management Database (CCMDB) is a platform for integrating data, workflow and policy across IT management processes. Built on a robust CMDB (Configuration management database), the CCMDB also includes the core set of pre-integrated configuration and change process capabilities to manage today's complex data center.

The CMDB delivers a shared understanding of the components, dependencies and configuration of critical business applications. It also integrates this data to operational processes within the IT environment, eliminate unanticipated change related problems, reduce problem resolution times, enforce technology consistency, process conformity and compliance policy and enable agile and responsive change. The CCMDB consists of following sub-components:

①Core CCMDB Data Platform: The data platform of the CCMDB provides a shared understanding of the components, dependencies and configurations of critical business applications. It also provides multiple mechanisms (discovery, integration, federation) to accurately populate and maintain the IT infrastructure data.

②Core IT Process Engine Platform: The CCMDB also includes configuration and change process capabilities to manage today's complex data center. The process managers provide a flexible set of best practice workflows that allows customers to manage their

configuration as well as implement change in their environment.

In our system architecture, CCMDB platform is leveraged to handle the IT service management data[1], workflow and policies across the enterprise infrastructure and application. To make it also available to mobile devices with the management ability of integrate mobile data, process and policies, we have extended the CCMDB platform to adapt to mobile applications. Model of mobile application and architecture is added to CMDB (configuration management database) dataset; The pre-integrated change and configuration process manger is extended to support change and configuration management in mobility-featured processes. Based on CCMDB, we also developed a set of best-practice process solutions that involves mobility management.

2.2 Device management server

Device Management(DM) is a set of technologies, protocols and standards used to allow the remote management of mobile devices. With the number of smart phones as working mobiles dramatically equipped to staffs by many enterprises today, there is a demand for managing, controlling and updating these devices in a safe and effective way. Device management provided the methods that can easily control and manage mobile devices over the air. Such management features includes: changing core configuration and registry settings; configuring, adding, updating, and removing software; updating operating system components, including executable files and libraries; activating software available in read-only memory (ROM) or installed over the air.

Open Mobile Alliance (OMA) DM [2,3] is a widely complied open standard in industry and supported by a lot of mobile software vendors and manufactures, such as Microsoft windows mobile, Nokia, Ericsson, Samsang. In our architecture design, device management service is responsible to complete all device management tasks remotely by implementing OMA DM protocols. It composed of DM server and DM client. Each managed mobile should have a client support OMA DM to perform tasks from server.

As shown in Fig.1, a device management server is designed to build on CCMDB platform to support DM functions in BlueStar architecture.This server implements OMA-DM protocol that supports core management functions of supported mobiles. The functions are mainly divided into 4 categories: Provisioning, Fault detection, Configuration and Security. The device management server will communicate with mobile client side through network. A DM functional client side should be enabled on the managed mobile, which will cooperate with the DM server to fulfill its management functions. In recent years, more and more mobile manufacturer start to compliance to OMA-DM protocol and even pre-install OMA-DM client software in their products, such as Nokia. OMA-DM protocol allows device management server to query basic device hardware information, operating system information, file system information, and installed application information from managed devices.

In BlueStar architecture, DM server is responsible for detecting and changing the configurations in managed mobile devices. For instance, in the middle of a mobile management process, DM server is asked to send out “Get” command to query one node in the management tree. The server will package the command in an XML format in compliance with OMA-DM protocol. The target mobile device receives this command if it connects to network. The DM client application embedded in this device will parse the command and call according component to execute the command, that is to get the node’s configuration parameter. Finally a response XML package includes the required data will be send back to server. After DM server gets the data, it needs to pre-process these data before sends it to CCMDB. So there is an adapter layer between DM server and lower CCMDB platform. The adapter transforms mobile configuration data to configuration items that conform to Common Data Model(CDM), which can be stored into CCMDB database.

2.3 Enterprise business application

The application layer within the whole solution, including business logic, database, application runtime environment, application scheduler and control are both support mobility work and can be accessed from outside the cooperate IT environment. The applications also work with other legacy enterprise systems such as email, calendar. For example, In BlueStar, an insurance claim

process will be started by customer calls at the server side, then claim is routed to an adjuster on his work mobile based on business rules (with factors such as claim location, type and complexity coming into play), and route back to server side when adjuster finished work. That will greatly increase the insurance worker's efficiency and minimize the processing time of each insurance case.

2.4 Enterprise management portal

Enterprise applications can be managed through this management portal. It consists a mobile management portal that provides employers and administrators to manage enterprise workforce mobile. The mobile management portal is built on device management server and several mobile platforms.

3 Implementation

Deriving full benefits from a CCMDB requires that the change management and the configuration management be tightly integrated. Change management and configuration management represent the main control processes for the IT environment. Change management relies on configuration management for accurate information on the authorized view of the environment. Configuration management relies on change management for information on planned and completed changes to the environment so that an accurate representation of the environment is maintained. According to ITIL, all changes to the environment, other than standard service requests, should be under the control of change management. CCMDB is one of the first products in the industry that fully integrates change and configuration management.

3.1 Change management

A change is defined as any installation or alteration of hardware, system and application software, procedures, and environmental facilities that adds to, removes from, or modifies the service delivery environment. Change requests can be initiated by an administrator or by an automated service support process.

A change-management process is defined with Change Process Manager as follows to maintain information in the CMDB on each RFC throughout its life cycle. The information includes relationships between the change and the affected CIs. It is essential that this information be updated by using the configuration-management process.

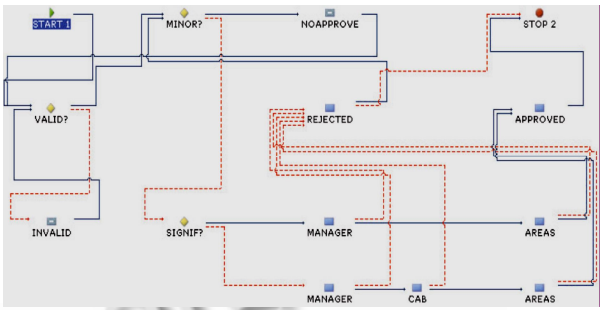

Fig.2　ITIL change management workflow

For instance, a mobile user take a business trip to another city, he finds that the there are time differences between the trip city and his local city. He decides to change the time settings in his mobile, but the change of time zone will affect the insurance claims processing because the application logic relies on accurate time. The time conflicts will cause the database stores wrong data. So he needs to trigger a change workflow depicted as below.

In this scenario, when a change management workflow instance is activated by a submitted change request from the BlueStar system remotely, the change request is firstly estimated to be a none minor changes, so the request is routed to have an impact analysis. It shows this kind of changes will not affect other applications but need to transfer the time zone of remote mobile data to local time in accordance with business database. The result of impact analysis is sent to manager to get approval. Manager receives the request with impact report, and approves it. Then DM server will communicate with the mobile and change the mobile settings automatically. After change executed successfully, the server will be noticed by a mobile response. In the end, this mobile change management workflow stop and all related information is collected to keep a record.

To implement the mobility change management scenario, we integrated IBM Tivoli CCMDB platform[4] and open source OMA-DM server[5]. We tested the demo on a Windows mobile smartphone. Fig.3 shows the OMA DM command send to mobile to change the mobile's

time settings.

```
<Replace>
    <CmdID>1</CmdID>
    <Item>
<Target><LocURI>./Vendor/MSFT/Clock/TimeZone</
LocURI></Target>
        <Data>4</Data>
    </Item>
</Replace>
```

Fig.3 Change mobile time zone DM command

3.2 Configuration management

Configuration management is the process for identifying, defining, and maintaining information on the IT components and services of an IT system. Configuration management also maintains information on how those components relate to one another and to service-support (part of ITIL) process artifacts, such as change records. This logical representation of the environment is used by other ITIL processes in service support and service delivery. Thus, configuration management includes the following processes: identify CI, control CI, verify and audit CI, and report status of CI.

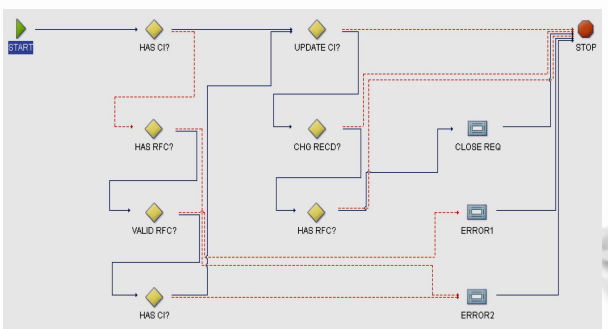

Fig.4 ITIL configuration management workflow

Take software provisioning as an example, when a new staff onboard and acquired a work mobile, enterprise IT administrator will be required to update applications and change mobile application configurations, such as user name and password. Then a typical workflow of ITIL configuration management designed with Configuration Process Manager as below will be launched to fulfill the process.

Such an instance will be fired when an IT administrator initiates a new request in the system that updates the mobile client business application and its settings. After passing several criterions, the workflow automatically routes the upgrade request to do impact analysis in the step “UPDATE CI”. Impact analysis will try to detect the potential problem to be occurred. In the analysis, how big the effect this application upgrade operation will bring to the whole IT infrastructure and upper layer business logic is computed. For example, it may deduce create new accounts in the system will affect the security settings in the back office system. During the process, server will communicate with these mobile devices, and remind the user of this provisioning and update. After a user agrees, the mobile client side will communicate with OMA DM server to execute the configuration update task. When the mobile application configuration successfully updated, a conformation message will send back to server and the total process is ended. Fig.5 depicts the OMA DM command send to mobile to create a new email account for the user.

```
<Atomic>
    <CmdID>1</CmdID>

    <Add>
        <CmdID>2</CmdID>
        <Item>
<Target><LocURI>./Vendor/MSFT/EMAIL2/%7BC556
E16F-56C4-4edb-9C64-D9469EE1FBE0%7D</LocURI
></Target>
            <Meta>
                <Format
xmlns="syncml:metinf">node</Format>
                <Type
xmlns="syncml:metinf">text/plain</Type>
            </Meta>
        </Item>
    </Add>

    <Replace>
        <CmdID>3</CmdID>
        <Item>
<Target><LocURI>./Vendor/MSFT/EMAIL2/%7BC556
E16F-56C4-4edb-9C64-D9469EE1FBE0%7D/SERVICE
NAME</LocURI></Target>
            <Meta>
```

```
            <Format
xmlns="syncml:metinf">chr</Format>
            <Type
xmlns="syncml:metinf">text/plain</Type>
          </Meta>
          <Data>My Email</Data>
        </Item>
    </Replace>

    <Replace>
        <CmdID>4</CmdID>
        <Item>
<Target><LocURI>./Vendor/MSFT/EMAIL2/%7BC55
6E16F-56C4-4edb-9C64-D9469EE1FBE0%7D/SERVI
CETYPE</LocURI></Target>
          <Meta>
            <Format
xmlns="syncml:metinf">chr</Format>
            <Type
xmlns="syncml:metinf">text/plain</Type>
          </Meta>
          <Data>IMAP4</Data>
        </Item>
    </Replace>

    <Replace>
        <CmdID>5</CmdID>
        <Item>
<Target><LocURI>./Vendor/MSFT/EMAIL2/%7BC55
6E16F-56C4-4edb-9C64-D9469EE1FBE0%7D/INSER
VER</LocURI></Target>
          <Meta>
            <Format
xmlns="syncml:metinf">chr</Format>
            <Type
xmlns="syncml:metinf">text/plain</Type>
          </Meta>
          <Data>imap.mail.yahoo.com</Data>
        </Item>
    </Replace>
    <Replace>
        <CmdID>6</CmdID>
        <Item>
<Target><LocURI>./Vendor/MSFT/EMAIL2/%7B
C556E16F-56C4-4edb-9C64-D9469EE1FBE0%7D
/OUTSERVER</LocURI></Target>
          <Meta>
            <Format
xmlns="syncml:metinf">chr</Format>
            <Type
xmlns="syncml:metinf">text/plain</Type>
          </Meta>
          <Data>smtp.mobile.yahoo.com</Data>
        </Item>
    </Replace>
……
</Atomic>
```

Fig.5　Create an email account DM command

3.3 Evaluation

For evaluating the efficiency and effectiveness of change management process and configuration management process discussed above, BlueStar uses the KPI (Key Performance Indicator) Manager in CCMDB to create KPIs which provide means to track critical performance variables over time, such as Change efficiency rate, Major change to be done. KPIs can be viewed either in the Start Center or directly with the KPI Manager. By these critical performance variables, BlueStar can improve the definition of the workflows to better enhance productivity of ITIL-compliance processes in mobile application environment.

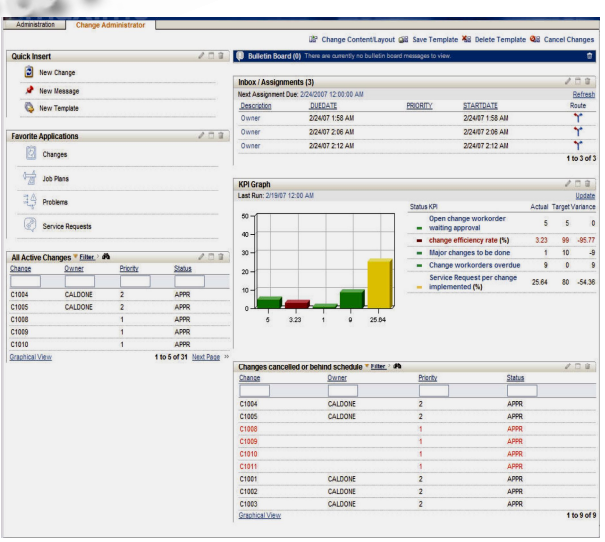

Fig.6　CCMDB KPIs

4 Related Works

There are lots of research and efforts both in academic and industry on enterprise mobile management. The OMA proposed DM framework that defines the management information for the mobile devices in the form of DM tree and how to manage the mobile devices through DM protocol. Many mobile operators and wireless equipment vendors involved in this technology and have their own solutions. Such as Innopath's MDM solution[6]; Red Bend's vDirect Mobile[7]; Nokia Intellisync Device Management[8] and Microsoft Mobile Device Manager 2008[9]. The Above solutions implement OMA DM and provides platforms to control managed mobiles. However, how to integrate the managed work mobiles in complicated enterprise IT environment is still a challenge. BoxTone[10] develops BlackBerry platform mobile user management with ITIL and ITSM. But it only focused on providing mobile user a connection from BlackBerry smartphones to enterprise ITSM system. Compared to these works, our approach not only leverages standard device management but also extends ITIL-based change and configuration capabilities to mobility.

5 Conclusions

In this paper, we present an integrated method to manage mobility in enterprise through ITIL change and configuration processes. We have implemented the BlueStar architecture and tested with typical mobile management scenarios in insurance industry. The system automated mobile management and extended standard ITIL processes to mobile platform. In future work, we will make further empirical studies on mobility management with more ITIL workflows and integrated with other popular mobile platforms.

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