

Cloud Service for Transformation of On-site Work through Smart Devices

● Susumu Terasaka ● Masatomo Yasaki ● Norie Tachibana ● Hiroyoshi Kasai

The use of smartphones, tablets, and other smart devices is expanding in society, and even companies and organizations are coming to adopt them on a large scale. Introducing smart devices in the workplace has the potential of transforming on-site work and fostering business innovation. Their introduction, however, presents particular problems to an enterprise. For example, a company must implement measures against terminal loss and unauthorized use even in the initial stage of introduction. In fact, a wide range of issues need to be addressed including compatibility with existing business functions and requirements, the ease and cost of operations, and the visualization of on-site work for decision-making purposes. Fujitsu provides FUJITSU Cloud Service MobileSUITE as a cloud-based service to solve these problems. This service provides benefits corresponding to the various stages of using smart devices in business, from countermeasures against terminal loss and unauthorized use to functions for making application development and operation more efficient and facilitating the linking of smart devices with existing business systems. This paper describes how MobileSUITE can solve the problems arising from the use of smart devices in the workplace and presents case studies.

1. Introduction

The use of smart devices for on-site business applications is expanding. In sales, for example, salespersons are using tablets to present products in digital catalogs when visiting customers. In facilities inspections, maintenance personnel are using tablets to check procedure manuals and maintenance history and to record work results on-site, which means more efficient and reliable operations. In this way, the tablet is becoming an indispensable tool for various types of work in the field.

It has become very important for companies that have systemized their business functions and accumulated business data to be able to access that data on-site from smart devices to make on-site work more efficient and thereby achieve higher added value. Incorporating smart devices in on-site work also enables information to be gathered from work sites for use in decision-making, which helps to enhance the company's competitive strength.

On the other hand, there are many issues that need to be addressed when using smart devices in the

above way. For example, connection methods and security measures must be provided when accessing existing systems from smart devices. This is especially true when existing systems are located on-premise.

To solve these problems, Fujitsu provides a mobile utilization platform called FUJITSU Cloud Service MobileSUITE¹⁾ (hereafter, MobileSUITE) as a cloud-based service that upgrades its customers' business systems to mobile and supports efficient mobile-based operations.

In this paper, we first describe the use of smart devices in enterprises and organizations and resulting issues and present MobileSUITE case studies. We then present the functions provided by MobileSUITE and discuss how they support the business use of smart devices. Finally, we consider the future outlook for MobileSUITE and the expanded use of smart devices in business.

2. Use of smart devices in business

It is said that the business use of smart devices can be divided into several stages in accordance with

the extent of that use.^{2),3)} In this section, we examine typical usage patterns and related issues and the application of MobileSUITE in each of three stages.

2.1 Stage 1: Introduction of smart devices at business sites

This stage corresponds to the introduction of smart devices at business sites.

For example, about the time that tablet computers appeared on the scene, there were many examples of introducing only terminals in the name of workplace digitization without having any concrete method of using them for business. More recently, a further introduction of smart devices has been triggered by hardware upgrades as company-issued mobile phones come to be replaced by smartphones and office personal computers by tablets.

In this stage, the introduction of terminals alone means that business itself is conducted as before and that the method of using smart devices is left to the discretion of the workplace targeted for introduction. For example, smart devices can be effectively used at sites involved in public relations or maintenance inspections by digitizing all related materials, which have traditionally been paper-based and difficult to carry around. In addition, terminal functions can be used at this stage to improve business processes. For instance, the smartphone's built-in camera can be used to record scenes or objects, and the e-mail function can be used to send daily reports from the field when permitted by a company's security policy, which enables the employee to return home directly.

On the other hand, this usage scenario runs the risk of terminal loss or theft or leaks of business information through terminal abuse. MobileSUITE can deal with such risk through integrated management functions. However, since only general-purpose terminal functions are used in this scenario, there is a limit to what can be achieved. As a result, there is much room for improvement here for all sorts of business tasks.

2.2 Stage 2: Use of mobile-compatible business service

The next stage goes beyond a terminal's general-purpose functions through the use of mobile cloud services for business and mobile-compatible functions in business packages. The main factors prompting a

transition to this stage are revisions of existing packages and introductions of new solutions, or a review of how smart devices are being used at the Stage 1 level.

It is typical in this stage to use remote services to reference and update e-mail, schedules, and other types of data without leaving the related data on the terminal itself or to use mobile-compatible functions of existing frontline business packages such as sales support, customer information management, and customer reception.

These are functions and services that are provided for business purposes, so countermeasures to information leaks are generally implemented. In addition, providing overall support for specific business tasks in this way greatly improves the efficiency of business processes. However, these are existing, off-the-shelf services and functions that may be difficult to align with the unique features of the company's business. In fact, some functions needed by the company may not even be provided by these services. Moreover, services that need a network connection may be severely limited, such as at locations where radio signals cannot be received.

A case study of applying MobileSUITE in this stage is Fujitsu's collaboration with the Hiroshima Prefectural Federation of Chambers of Commerce and Industry.⁴⁾ This federation dispatches management consultants to small businesses who are members of local chambers of commerce to provide information and advice. The consultants traditionally brought along paper materials when visiting businesses and filled out their daily reports only after returning to their offices. This system, however, had a number of problems besides having to carry around a large volume of material. For example, if the materials needed on a particular visit turned out to be different than expected, it would not be possible to present them on that visit. Moreover, since a consultant would prepare daily reports after some time had elapsed, gaps in the record could occur if certain information had been forgotten. In addition, the type of advice to give and the way of providing it differed among consultants, so there was variation in the level of guidance.

To solve these problems, Fujitsu transformed this work style by introducing a customer information management system with mobile communications as well as on-site usage supported by MobileSUITE. This

approach enables a consultant to access the customer information management system from a tablet and to record the advice given, current business conditions, etc. and reference past records on-site during a visit. In addition, the Mobile Portal function of MobileSUITE enables a consultant to give advice using up-to-date materials at any time regardless of the communications environment at the site visited. Plus, an application for recording visits and advice and an operation logging function enable automatic registration of advice content, business conditions, materials usage history, etc. for later use. This makes it possible to standardize the way in which advice is given and to share information among the management consultants.

2.3 Stage 3: Transformation and visualization of on-site work

This is the stage that leads to business expansion by achieving the transformation distinctive of smart devices in the workplace. It features the linking of smart devices with a company's mission-critical business systems and the collection and visualization of on-site information. The main trigger for making a transition to this stage is management-level decision-making that uses smart devices in countermeasures to business and management problems including those of on-site work.

This stage assumes the development and use of applications that are connected to business systems and optimized for the company's line of business. These applications incorporate location information, tangible thing information, and evidence obtained by GPS and camera functions built into smart devices. This stage can lead to a transformation of on-site work through the application of smart device features in a form optimized for the company, as in expanding the use of terminals by using user interfaces (UIs) such as touch panels and voice input that are easy to use compared with conventional personal computers. Another positive feature of this stage is enhanced collection of information from the field, resulting in business decisions based on reliable data.

Common problems to be faced by companies entering this stage are the development and operation of applications optimized for the company's business, achieving efficient linking with mission-critical business systems, and ensuring security.

A case study of applying MobileSUITE in this stage is Fujitsu's joint project with the Shizuoka Shimbun, a newspaper company.⁵⁾ This company has been working to transform the material-gathering activities of its reporters, the foundation of its business. To this end, they have supplied its reporters with smartphones that can be used just about anywhere compared with conventional laptop computers. The idea was to enable a series of tasks, from material gathering and picture taking to article creation and data transmission (manuscript submission) to be performed with a single smartphone. To achieve this, the company planned to construct a system that would enable articles and photographs to be submitted to its computerized typesetting system (CTS). However, reducing the cost and time of developing a huge system for linking smartphones to the newspaper's CTS was a problem that had to be solved. Another problem was how to deal with lost terminals, which is a situation that is bound to occur when introducing smartphones for business use.

MobileSUITE was introduced as a solution to these problems. To begin with, the MobileSUITE application programming interface (API) gateway provides a variety of functions to enable linking between smartphones and the CTS. These include functions for providing IDs, for creating data definitions, and for performing authentication processing beforehand for linking purposes. This gateway made it unnecessary for the Shizuoka Shimbun to study, design, develop, and implement such functions on its own, thereby reducing development costs. Using MobileSUITE in this way enabled the system to be constructed in four months. In addition, the Mobile Portal function of MobileSUITE made it possible to streamline the development and distribution of applications for smartphone use, and the integrated management functions of MobileSUITE solved the problem of dealing with lost terminals. The Shizuoka Shimbun aims to make this system even more convenient for its reporters through a variety of upgrades such as voice input of articles and the automatic sending of location information from the site where news is happening.

3. MobileSUITE features and function configuration

MobileSUITE is a platform service for using smart devices in business. It consists of service functions

running in the cloud and terminal platform functions running on smart devices linked to the service functions (Figure 1). These functions can be broadly divided into three types: integrated management, Mobile Portal, and API gateway.

MobileSUITE is configured to provide benefits for each of Stages 1–3 described above. The following describes the functions and features of MobileSUITE and presents solutions to problems that arise in the use of smart devices for business.

3.1 Integrated management functions

These functions perform unified management of terminals, applications and content, and users (Figure 1). They enable a system manager to determine who is using which terminal, manage terminal usage policies, and control terminals remotely, all through a Web-based management console. As a result, terminal location and user information can be centralized, which makes it easy to perform an across-the-board inventory. Furthermore, in addition to prohibiting the installation of unauthorized applications and collecting terminal usage logs, these functions can be used to prevent information leaks by remote terminal locking and data deletion in the event of terminal theft or loss.

MobileSUITE incorporates the following functions and schemes to enhance the reliability of the above

management functions and reduce the cost of their implementation.

1) Group-specific management functions

These functions enable users to be divided into various groups and managers to be assigned to each group. They enable policies and applications/content to be managed separately by group. This approach makes it easier to deal with a large organization and to carry out management and operations that match the business content of each group.

2) Web API

In addition to a management console, MobileSUITE provides a Web API based on the Representational State Transfer (REST) architecture as a means of performing general management operations. This Web API makes it possible to automate management and business operations as in the automatic updating of content from another system and the automatic reflection of terminal inventory data in a legacy management system.

3.2 Mobile Portal functions

Mobile Portal functions enable the user to safely use the applications and content specified by the integrated management functions on a terminal. They consist of the Mobile Portal service running in the cloud and the Mobile Portal application running on the smart

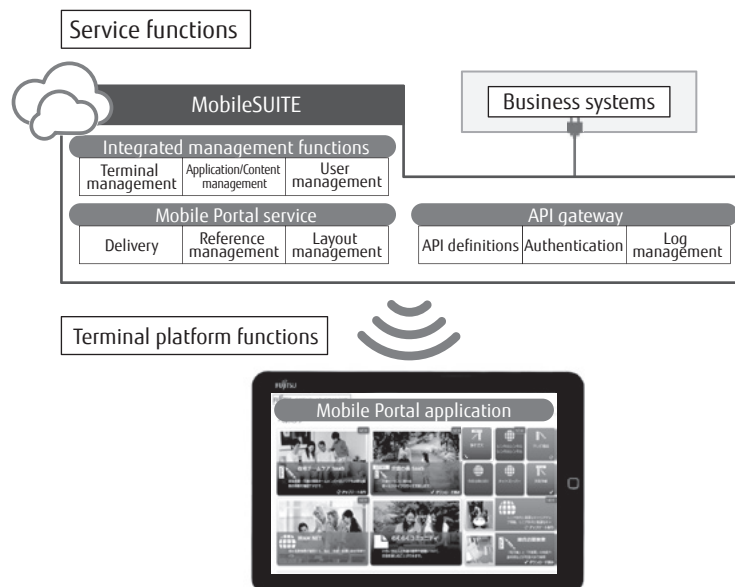


Figure 1
Configuration of MobileSUITE.

device. MobileSUITE allows for the use of HTML-based applications here (**Figure 2**).

The system manager uses a Web-based management console to register groups of content needed for business, design the display layout, and enable/disable content referencing in accordance with user attributes. A display layout attractive to customers can be designed by making use of various features such as the ability to use any image for each screen button (tile). The user, in turn, can make smooth use of the business content laid out on the screen by logging into the Mobile Portal application.

Registered applications and content are always protected through encryption (**Figure 3**). Initially, at the time of registration, applications and content are stored on the server after being encrypted, and they are delivered to the Mobile Portal application in an encrypted form. Furthermore, for cases in which an application needs to save data on the smart device itself, MobileSUITE provides an encryption-and-storage function for applications running on the Mobile Portal application. This means that business data is consistently protected by encryption. The most secure, commonly used AES-256 method is used for encryption. This and other security measures including those provided by terminal management of the integrated management functions help to make the risk of

business data leaks exceedingly small.

A MobileSUITE user can prepare HTML applications by using the open standard languages of HTML5, JavaScript, and Cascading Style Sheets 3 (CSS3), which makes these applications OS independent. In addition to supporting these standards, the Mobile Portal application provides an API group that supports the use of smart devices in business through authentication and device functions, content linking, log collection functions, etc.

Supporting the provision of HTML applications by the Mobile Portal application in the above way provides the following benefits.

1) Multi-OS support

Smart devices run mainly on OSs like Android, iOS, and Windows. As a consequence, it is generally necessary to develop as many applications as the number of OSs, using a different language for each OS. This results in a major burden on application development and maintenance. However, HTML applications are OS independent, so this problem does not arise.

2) Simple application distribution

Distribution of applications for use by smart devices usually requires procedures and screening methods determined by the OS vendor. Upgrading applications therefore requires a certain amount of time and incurs costs. In contrast, HTML applications running on the Mobile Portal application can be added or updated at any time by the system manager.

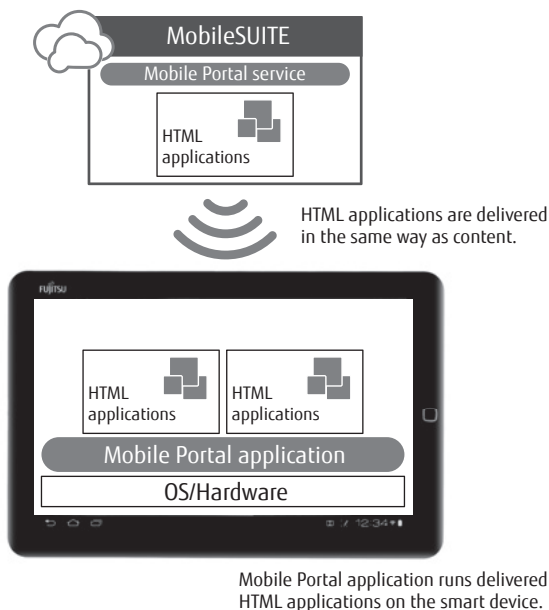


Figure 2
Mobile Portal application and HTML applications.

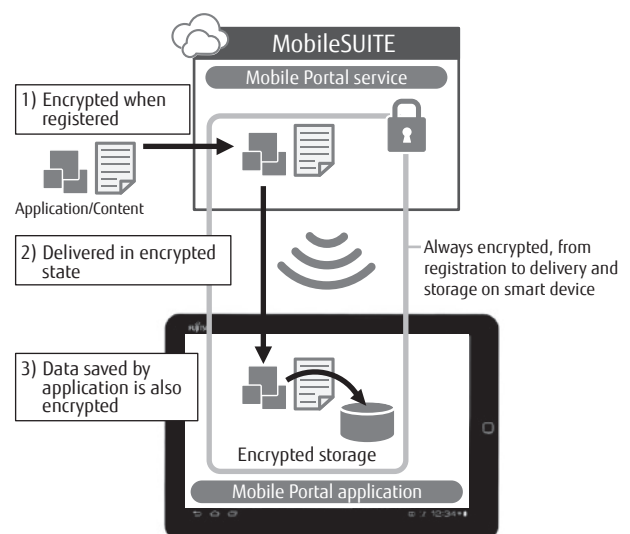


Figure 3
Application and content encryption.

3.3 API gateway functions

These functions support the use of business systems and mission-critical systems from applications running on a smart device.

To enable a smart device connected to the Internet to connect to an on-premise system, some means of linking must be prepared in the system itself. Besides this, it is also necessary to accept a connection from the Internet to the company's internal network, which calls for a sufficient level of security. This is generally handled by revising the network's configuration and settings and deploying or enhancing relay servers in a demilitarized zone (DMZ).

API gateway functions substitute for the above mentioned security measures between the smart device and on-premise facilities. They include a function for achieving unified management of communications from smart devices via a graphical user interface (GUI) and a function for performing connection tests. The use of these gateway functions can greatly reduce the time and labor incurred by design studies and development work for security measures while achieving efficient operations and management.

The API gateway enables a manager to create, deploy, and manage a connection-related definition (hereafter, API definition) for each linked destination. As in the case of the integrated management functions, these operations can be easily performed on a Web-based management console or via a REST-based Web API.

The following summarizes key API gateway functions.

1) User authentication function

The API gateway provides a software development kit (SDK) oriented to HTML applications. On logging into the Mobile Portal application, the authentication information obtained at this time is also used for accessing the API gateway. This enables the user to execute and use an application that links with a business system without having to perform another login operation. The API gateway denies access to a user who cannot be authenticated, thereby protecting on-premise systems from unauthorized access.

2) Application authentication function

The system manager issues an API key to an HTML application developer for each API definition and can require the transmission of this API key when accessing

the API gateway. Keys can be individually enabled and disabled, which enables a connection from an invalidated application to be immediately cut off. In addition, the access history of each HTML application can be recorded so that usage conditions can be later analyzed.

3) API execution log

This function records access to the API gateway for each API definition and makes this history available in comma-separated values (CSV) format. Since system access from smart devices has been centralized by the API gateway, this function can determine and analyze overall system usage conditions.

4) Creation and testing of API definitions

An API definition includes many items to be set such as data substitutions and methods to be used. The API gateway provides a mechanism for testing API definitions and checking for errors before implementing in an actual operating environment.

4. Future outlook

The functions described above make MobileSUITE a cloud service that promotes the transformation of on-site work based on smart devices. Looking to the future, Fujitsu seeks to promote even further innovation in the workplace through the following activities.

First is the provision of a mobile Backend as a Service (mBaaS) function. This is a service that provides server-side functions that are often used by applications running on smart devices. Given a scenario in which server functions oriented to smart devices are needed but not provided by the existing system, an mBaaS function can greatly reduce the need for individual customers to construct, develop, and operate a server for this purpose. In this way, applications and systems specific to on-site work can be developed more quickly and efficiently.

Fujitsu also seeks to add functions that enable smart devices to be used in a more advanced manner so that the Mobile Portal application can be easily used from HTML applications. We can expect business transformation to accelerate in the years to come as the functions and performance of smart devices continue to be improved.

Additionally, the provision of adaptors to facilitate linking with diverse cloud services will help connect customer cloud use directly to a transformation of

on-site work.

5. Conclusion

This paper described the use of smart devices in business and the related issues and explained how MobileSUITE can be used to resolve those issues. The use of smart devices in business is expected to expand and diversify in the years to come. Fujitsu intends to enhance the content of MobileSUITE to encourage even more customers to use smart devices and thereby transform their business operations.

References

- 1) Fujitsu: FUJITSU Cloud Service MobileSUITE® (in Japanese).
<http://www.fujitsu.com/jp/services/application-services/paas/mobile/>
- 2) Nikkei BP: Changing the Workplace by Mobile First. Nikkei Computer, Nov. 27, 2014 (in Japanese).
- 3) Nikkei BP: Why Introduction of Tablets Sometimes Fail. Nikkei Computer, Dec. 26, 2014 (in Japanese).
- 4) Fujitsu: Using Work Style Innovation to Stimulate Regional Economic Growth: Hiroshima Prefectural Federation of Chambers of Commerce and Industry. FUJITSU JOURNAL, Oct. 22, 2015.
<http://journal.jp.fujitsu.com/en/2015/10/22/01/>
- 5) Fujitsu: Smartphone Manuscript Submission System for Creating Articles, Taking Pictures, Submitting and Checking Manuscripts with a Single Smartphone--Case Study of the Shizuoka Shimbun. FUJITSU JOURNAL, May. 23, 2016.
<http://journal.jp.fujitsu.com/en/2016/05/23/01/>



Norie Tachibana

Fujitsu Ltd.

Ms. Tachibana is currently engaged in the development of MobileSUITE products.



Hiroyoshi Kasai

Fujitsu Ltd.

Mr. Kasai is currently engaged in the development of MobileSUITE products.



Susumu Terasaka

Fujitsu Ltd.

Mr. Terasaka leads the planning, development, and operation of MobileSUITE and related products.



Masatomo Yasaki

Fujitsu Ltd.

Mr. Yasaki is currently engaged in the planning, development, and operation of MobileSUITE products.