

SystemDirector Enterprise - A Business System Construction Platform to Facilitate Development of Applications Compatible with Smart Devices

KOBAYASHI Shigenori, KOIZUMI Ken

Abstract

Utilization of smart devices for enterprise systems is becoming increasingly popular. Yet, a wide diversity and variety of smart devices makes it necessary to develop applications that are compatible with multiple devices and platforms. This paper describes techniques for developing applications for smart devices that combine native application development technology with web technology including HTML5 as enabled by the SystemDirector Enterprise (SDE) business system platform.

Keywords

HTML5, jQuery Mobile, smart device, application development environment, SystemDirector Enterprise

1. Introduction

In recent years, in addition to supporting increased task efficiency the business use of information technology (IT) has been shifting towards strengthening competitiveness. In this climate, there has been a fast-developing trend that smart devices (smartphones and tablet terminals) with high portability and usability are being introduced at the front end of enterprise systems as a means of improving business solutions and promoting the acquisition of new customers.

However, when smart devices of various models and OSs are to be used for enterprise systems, application developers need to focus on the various issues listed below.

- (1) Development efficiency: Compatibility with new technologies, learning a native application language according to the OS, and utilization of existing assets.
- (2) Ease of compatibility with multiple devices: Implementation of applications compatible with each device, and quality assurance.
- (3) Ease of release: Establishment of a means of distributing applications, conclusion of contracts for distributing the applications, and preparation of certifications and their incorporation in the applications.

While native application development environments for smart devices are evolving individually, web technologies such as HTML5 and CSS3 are becoming increasingly standardized. Web technologies can now acquire location information by GPS, device access and offline processing of an

acceleration sensor, etc. In other words, smart device applications can now be developed with web technologies alone. Web browsers incorporated in smart devices, in particular, are quickly becoming compatible with HTML5, making it possible to achieve highly functional web applications.

By applying web technologies to the development of smart device applications, application developers can enjoy benefits as follows.

- (1) Development efficiency: Usability of development skills for existing web applications and ease of access to existing systems and data.
- (2) Ease of compatibility with multiple devices: Ease of compatibility with various devices and to a certain degree, ease of testing thanks to the debugging capability of PCs.
- (3) Ease of release: Usable when installed in a web server.

As mentioned above, web applications based on HTML5 have features that include development efficiency, ease of compatibility with multiple devices, and ease of release. Nevertheless, they are unsuitable for functions that take full advantage of devices such as biometric authentication devices that are peculiar to smart devices and for functions that require real-time properties. When these functions are to be implemented, it is more effective to use native applications. To achieve smart device applications, it is necessary to have a platform that can achieve hybrid applications that takes advantage of web applications and native applications optimally and accordingly.

This paper describes the features offered by SystemDirec-

SystemDirector Enterprise - A Business System Construction Platform to Facilitate Development of Applications Compatible with Smart Devices

tor Enterprise (SDE,) including the architecture and development methods of the framework to develop a hybrid application that allows HTML5-based web applications and native applications to work in conjunction with each other.

2. Issues When Smart Device Applications Are Developed and the Availability of Functions with SDE

In this section, problems that may arise when smart device applications are developed and the functions that SDE has to offer to cope with them are described.

When smart device applications are to be developed, the following points need to be investigated in addition to the points to be examined for the PC conventional systems.

- (1) Development process optimized for the development of smart device applications: Development process that deals with viewpoints peculiar to smart device applications such as considerations for user interfaces, security, and resources.
- (2) Architecture with high device portability: Application architecture with high portability that is compatible with multiple devices.

SDE offers the following functions that support the development of smart device applications.

- Smart device application program development guide
- Smart device application program development support generator
- Smart device application program framework

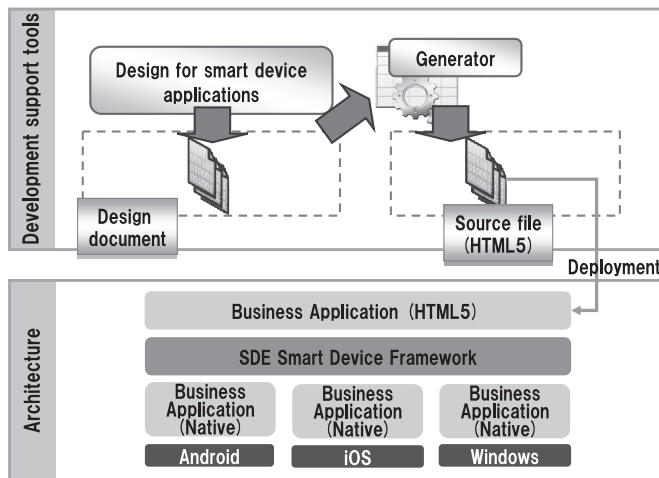


Fig. 1 Smart device application development support function of SDE.

Details are shown in Fig. 1 .

SDE offers templates for design documents optimized for the development of smart device applications. It also offers a function to automatically generate source codes (source code generator) in accordance with smart device frameworks based on the information contained in the design documents. These development support tools and frameworks are in accordance with the development process of smart devices and they will support smart device applications effectively.

3. Smart Device Application Development Using SDE

3.1 Smart Device Application Development Process

Based on the development methodology for enterprise systems that use conventional PCs as clients, the precautions and know-how for the development of enterprise systems that use smart devices as clients are systematically arranged according to the processes and are compiled as a guide. Moreover, the know-how for user interface design and the secure application program (AP) development are compiled respectively in separate guides (Fig. 2).

When multi-device compatibility is a must with smart device applications, it is necessary to investigate designs that take account of multi-device usage such as responsive web designs and progressive enhancement, as well as compatibility with touch-based user interfaces.

Although multi-device compatibility becomes easier to achieve by building smart device applications using HTML5-based web applications, the necessity of designs that take account of multiple devices remains the same.

Using web design methods for conventional PCs, it was possible to presume the screen resolution and the size of the display area of a browser to a certain degree. However, the increasing diversification of devices connectable to the web now makes it necessary for a smart device application to cope with various requirements. A smart device that requires consideration for viewing angles with the horizontal and vertical rotations has to take account of how to provide users with content effectively, in addition to uniformity of screen appearance.

Currently an approach called responsive web design that features variable designs based on the screen size of each device is winning popularity. With web applications, the use of Media Query functions specified by CSS3 can sort style sheets at points (breakpoints) where layouts such as screen sizes, devices, and orientations are changed and can now switch

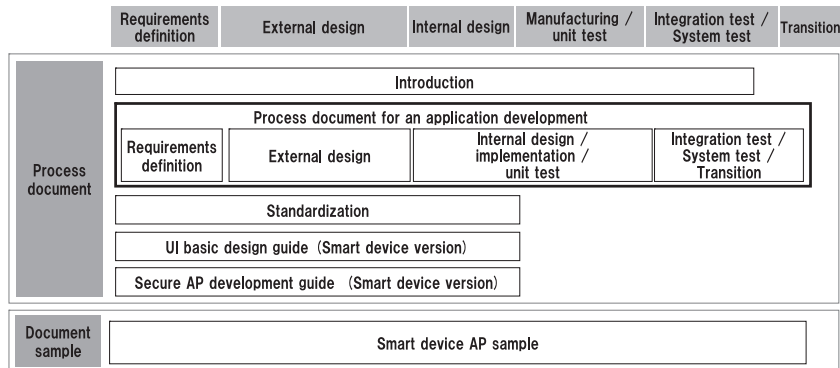


Fig. 2 Smart device application program development guide scheme.

between screens for smartphones, tablets, and PCs. Moreover, by taking advantage of RESS (REsponsive webdesign + Server Side Components), flexible control of image files according to the device and more advanced switching of devices will also be possible.

Furthermore, there are several different strategies available for design and layout implementation that are applicable in different browser environments. By embracing strategies such as “progressive enhancement” that offer the latest user interfaces for the latest browsers and “fault tolerance” that lowers functionality for earlier versions of browsers based on the latest browsers, smart device applications can be accomplished more flexibly.

Allowing these features to be implemented forms the initial stage of the application program development for which the manual and the user interface (UI) basic design guide have been compiled.

3.2 Smart Device Application Program Framework

The presentation layer including smart devices has a relatively fast pace of technological progress; it is a layer that features rapid revision. On the other hand, the application program layer and its business models have a long life. Smart device applications need to apply an architecture that can absorb such differences in the life cycles of the presentation and application program layers.

SDE offers a framework that achieves loosely coupled data communications between the presentation layer (smart devices) and the application program layer (servers) by using the standard specification REST/JSON (Fig. 3). This enables

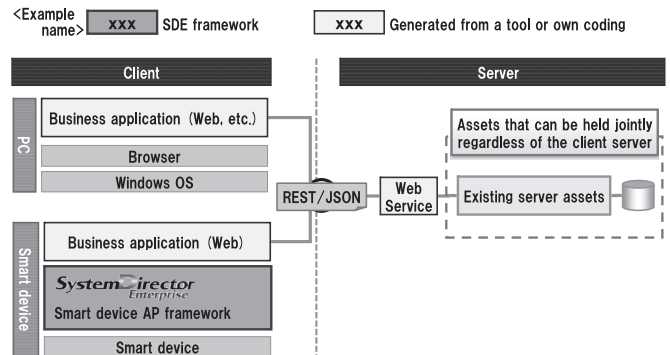


Fig. 3 SDE framework that enhances the reusability of existing assets.

the development of applications for PCs and smart devices on the client side while maintaining the business logic on the server side, thereby supporting the effective utilization of existing assets as well as the prompt accomplishment of services for smart devices. Moreover, by using the SaaS application development platform that SDE is able to offer, the early achievement of mobile cloud services will also be possible.

For the smart device application client, the framework is offered that supports the development of hybrid applications to link HTML5-based web applications with native applications. jQuery Mobile is used as the web user interface framework. This is a framework that offers user interfaces optimized for smart devices based on jQuery in the JavaScript library. It is offered as an extension of HTML5 and makes the web application development for smart devices more efficient. jQuery has the following features.

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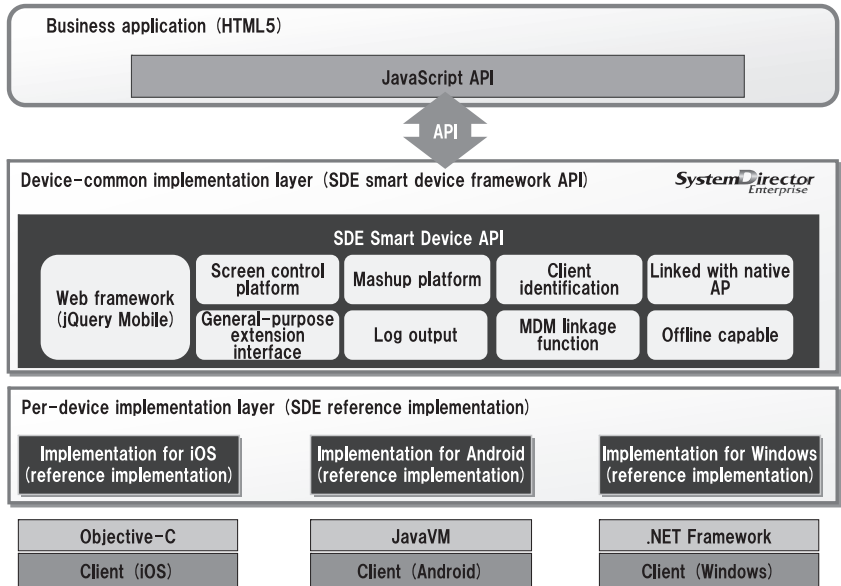


Fig. 4 Smart device application program framework.

- Due to its capability of allowing the user to achieve screen transition and dialogue animation easily and without using a program. It is useful even to designers.
- Confirmation of operation is possible to a certain degree on the desktop because it is also operable via a desktop PC browser.
- It is designed to write multiple pages in one HTML file, so that it is easily usable for offline applications.

In addition to jQuery Mobile, SDE offers a smart device application program framework that enables activation of functions such as native application linkage, MDM (Mobile Device Management) linkage, and log output, all via JavaScript (Fig. 4).

By separating the device-common implementation layer and the per-device implementation, it achieves an architecture that can more easily deal with the diversification and evolution of devices and it also may be customized readily.

3.3 Smart Device Application Development Support Tools

With HTML5, application program interfaces including Web Storage, Offline Application, Web Socket, and Web Worker are available additionally for the development of applications. This has changed the role of JavaScript, making it

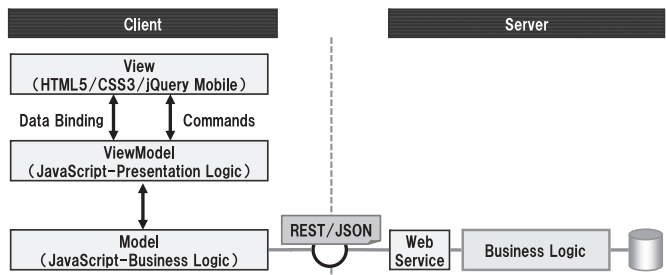


Fig. 5 Standard architecture using generators.

now, an indispensable programming language for the achievement of enterprise applications. Due to its capability to be embedded in HTML files, JavaScript nevertheless imposes the risk of considerably lowering the maintainability of business applications unless consideration is taken for a standard HTML/JavaScript architecture that separates view and logic. SDE supports the development of applications with uniform quality that eliminates individual dependency by offering a generator according to the architecture that separates viewing (HTML) and logic (JavaScript) (Fig. 5). In addition, the generator mechanism using design document templates as input is expected to provide the following effects:

- Improvement in design quality
- Elimination of communication loss during process transition
- Prevention of discrepancy between design documents and codes

4. Conclusion

This paper introduces procedures used to develop smart device applications. The utilization of smart devices for enterprise systems is now expanding rapidly. In response to this trend NEC is concentrating on the replenishment of smart device application platforms and is accelerating its efforts to deal with them precisely and effectively. NEC is committed to continue its efforts to better support the development of smart device applications by incorporating new technologies in the SDE platform.

SDE, which incorporates the above-mentioned functions, is scheduled to be released in April 2013.

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Authors' Profiles

KOBAYASHI Shigenori

Manager
IT Software Production Engineering and Quality Assurance Division
IT Software Operations Unit

KOIZUMI Ken

Assistant Manager
IT Software Production Engineering and Quality Assurance Division
IT Software Operations Unit

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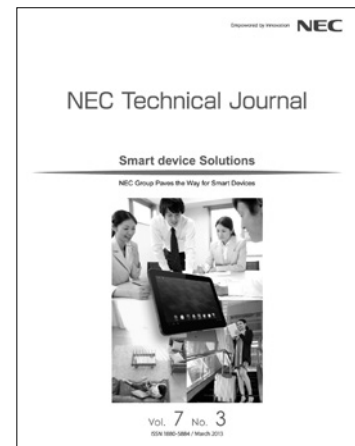
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Vol.7 No.3
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