SaaS Platform Services

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Abstract

With recognition of the cloud computing, SaaS and PaaS have been increasing and the need to incorporate these technologies in business operating systems has also been increasing. This paper introduces the "SaaS platform service," which is a PaaS that provides the functions required for the development of SaaS applications for business systems (authentication, user management, E-mail distribution, service linkages etc.) and for business development frameworks. The SaaS platform service makes it possible to improve development efficiency and reduce the operation costs as well as implementing hybrid business systems in which ownership and usage are well balanced. NEC offers the SaaS platform service as "RIACUBE/SP," which is a common platform of cloud oriented service platform solutions.

1. Introduction

The rise of the cloud computing has led to the recognition of SaaS, PaaS and IaaS and various services have been released resulting in an increased need for building quick, low-cost, flexible enterprise information systems by incorporating these technologies. At NEC, we offer the SaaS platform service in order to facilitate the conversion of business systems into services (into SaaS applications) and their linkages with existing services. We have prepared the functions required for business systems as well as a development framework in order to arrange and enhance the SaaS platform service as a service that is proven with regard to its actual operational utility. In the following sections of this paper we will introduce the SaaS platform service provided by NEC as an enterprise oriented PaaS.

2. What is the SaaS Platform Service?

The SaaS platform service provides a business system with the functions required for the development and operation of SaaS applications. It has four components; these are the "basic functions" that include authentication, user management and authorization control; the "common components" that include E-mail distribution and billing data generation, the "service linkage" that implements linkage with other services, and the "development framework" that covers the methodology as
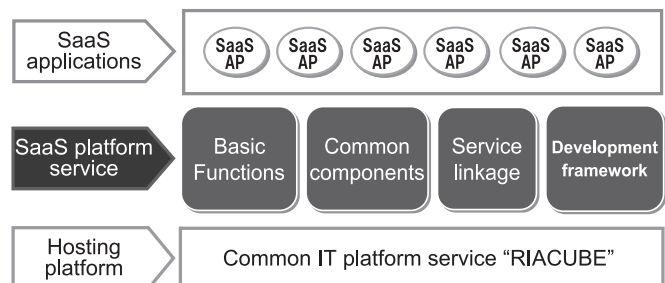

Fig. 1   SaaS platform service.

well as tools for the development of SaaS applications (**Fig.1**). The SaaS platform service runs on the common IT platform service "RIACUBE"; a hosting platform provided by NEC.

An enterprise or department that provides SaaS applications using the SaaS platform service is called the SaaS provider, an enterprise or department that uses SaaS applications is called the tenant and a user of the SaaS applications of each tenant is called an end user (**Fig.2**). A SaaS provider and a tenant may belong to the same enterprise group in the case of a private cloud computing being built within an enterprise group.

2.1 Basic Functions

The basic functions include "authentication," "user management" and "authorization control." The SaaS provider implements the management of tenants and users by linking these
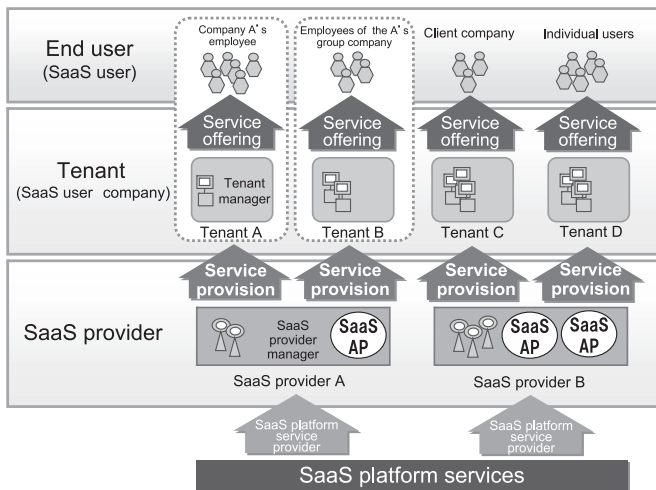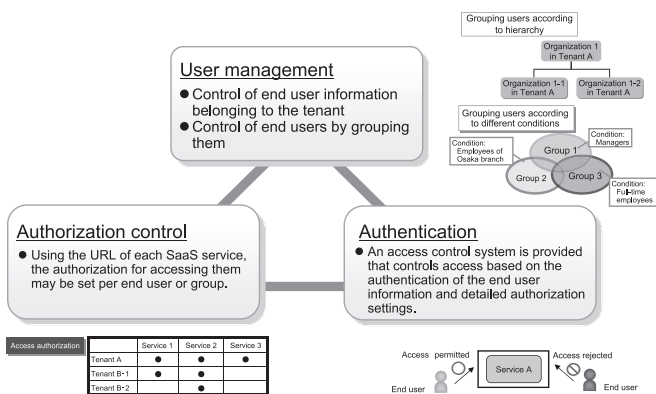
Fig. 2   Modes of use.

Fig. 3   Basic functions of SaaS.

Fig. 4   End-user settings based on roles.

three functions (**Fig.3**).

(1)Authentication

This function includes the mechanism that allows end users to authenticate themselves by entering the ID and password on the browser and the authentication API that is used by the SaaS providers to create the authentication screen on the SaaS application. A user information browsing screen is also provided. This shows basic information such as the number of registered tenants as well as the numbers of accesses to and the number of users of SaaS applications, the number of common component users and the number of transactions.

(2)User Management

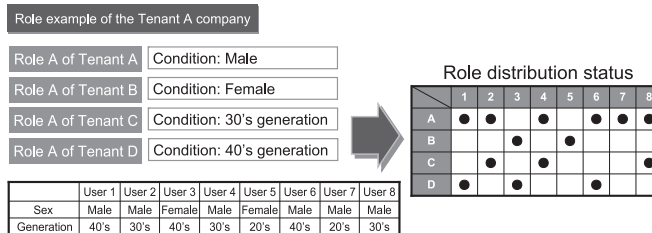This function allows the SaaS provider or tenant manager to register/update/delete user information on a browser. Batch processing of end-user information by specifying the date/time of application makes it possible to create a large amount of user information in advance and to register it simultaneously, e.g. when a lot of new employees are recruited etc.

In addition to the management per organization that covers the group companies and the setting of the hierarchy of official posts, group management is available for setting conditions (role) such as the distinction of persons engaged in the work as a main job and those engaged in the another work with a support job. With the group management, the tenant Administrator can change user attributes promptly by simply changing their roles, without re-setting the end-user information individually (**Fig.4**).

(3)Authorization Control

This function sets the access authorization the SaaS applications and content area per tenant or end user. It is also possible to set the authorization for access to the functions in the SaaS application that can be expressed via a URL.

The SaaS Provider can set the access authorization on the browser of tenant administrators and the tenant administrators can then set access authorization on the browser for end users and groups.

2.2 Development Framework

When the business systems of group companies are developed based on the business system of the enterprise, the development efficiency, administration and maintenance functions can be improved by implementing a multi-tenant compatible application. Specifically, application of a multi-tenant framework makes it possible to localize characteristic sections of group companies and to develop them separately from the common processing. At the time of execution, the characteristic sections are loaded dynamically to be processed (**Fig.5**).
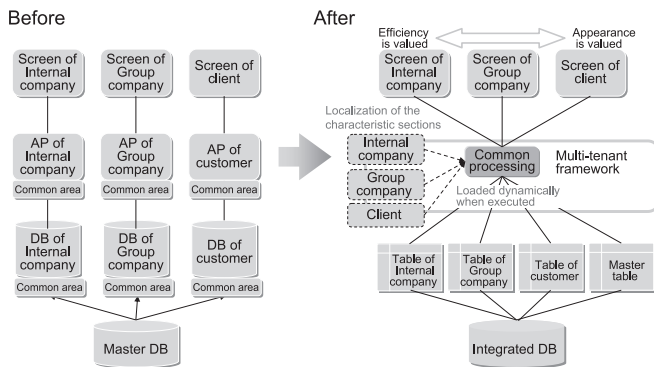
Fig. 5   Application of a multi-tenant framework.

The development framework is linked with NEC's SDE (SystemDirector Enterprise,) an "integrated development environment of business system" that provides development methodology and a components. This arrangement enables efficient development of the online processing of both rich and thin clients (web applications) as well as batch processing.

(1) Implementation of the Multi-tenant Application

The multi-tenant application can be implemented by controlling both processing and data access using the information of the tenant to which the end user belongs. The business application executes characteristic processing according to the tenant ID and the database is accessed according to the combination of the tenant ID and the business application.

Silverlight, a rich client is adopted because it is an RIA (Rich Internet Applications) technology capable of handling customization of a large scale system. It can easily meet the customization requirements, such as variations in screen switching per tenant and a change of URLs or port numbers accessed by end users (**Fig.6**).

For the thin-client system (web applications) we have adopted JSF-Spring-iBATIS and have prepared utility components including JavaScript GUI components and message outputs aimed at improving development efficiency.

(2) Online-batch Linkage

A function is provided for asynchronously launching batch processing from an online application. The online application decides the job queue order using the tenant ID and job name and requests the batch server to execute processing. The batch processing is executed according to the request and the results are stored in the database of each tenant in order to implement the online batch linkage.

2.3 Common Components

The functions provided by the common components include "E-mail distribution," "billing data generation" and "report format development." The use of these services allows the users to focus on their primary work, such as on the development and administration of the business logistics of the SaaS applications.
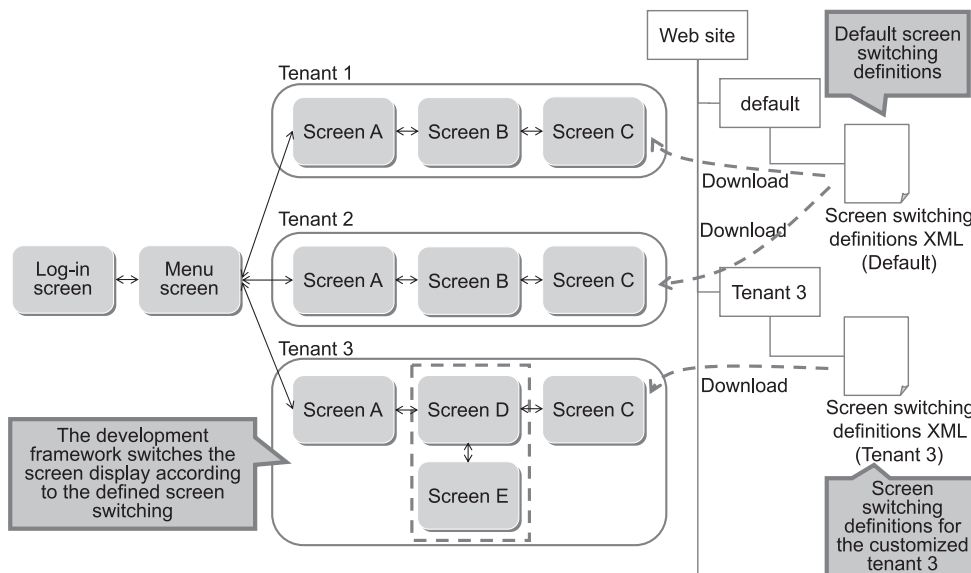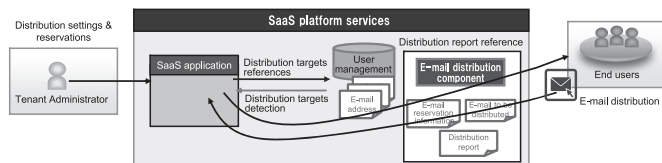

Fig. 6   Screen switching per tenant.

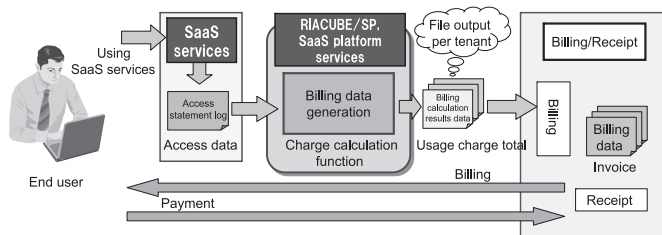Fig. 7   E-mail distribution for tenant managers.

Fig. 8   Billing data generation.

Fig. 9   Service linkage.

PDF from a large amount of data, control of access to the stored data and a registered data search.

2.4 Service Linkage

The service linkage allows a SaaS application in a business system or data center to use external cloud services.

This is implemented by Open Service Repository/Enterprise Gateway (hereafter "Enterprise Gateway"). The Enterprise Gateway has the function of relaying service linkages by converting linked information into a standard data format (normalization) and by then converting the standard data into the data format used by the linkage destination (denormalization). Even when an external service is changed, this function can deal with it by simply changing the normalization/denormalization rule so that the affected range can be localized regardless of the number of connection destinations. In addition, when the Enterprise Gateway is used to connect standardized services such as EDIFACT [*1] or ECALGA [*2], it is possible to implement service linkages that are unaffected by the number of linked SaaS applications (**Fig.9**).

3. Merits of the SaaS Platform Service

According to our estimates the SaaS platform service is expected to reduce the costs of the development and administration of the application of business systems by about 30% from

(1)E-mail Distribution
This function provides the service with which the tenant manager distributes E-mails to the end users. An API with HTTPS communication compatibility is provided to enable reservation of the distribution time/date and acquisition of the distribution result and read/click measurement results (**Fig.7**). Together with the text, HTML, multi-part and "Deco-Mail" file formats supported for E-mail distribution the function may also be used to distribute mail magazines to end users.

(2)Billing Data Generation
This function generates billing data of tenants and end users according to the usage of SaaS applications based on the predetermined tariff system (**Fig.8**). Billing data per SaaS provider or tenant can be generated based on the connection time, number of accesses and number of contents used. The function is also compatible with the service charge reduction campaigns, as well as with the volume discount tariff system.

(3)Report Format Development
This function is provided via API to create reports in a PDF file and store it in the specified folder according to the PDF creation instruction from a SaaS application. In addition, it enables real-time processing, batch processing for creating a
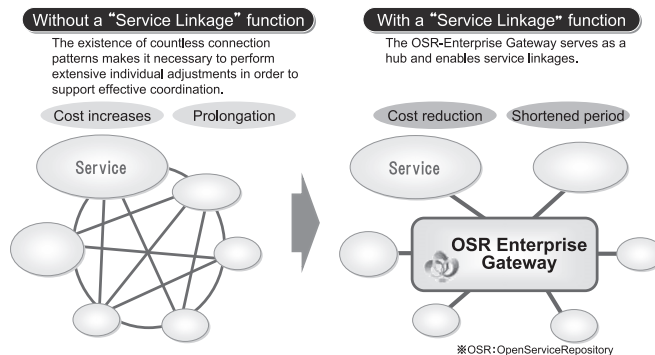
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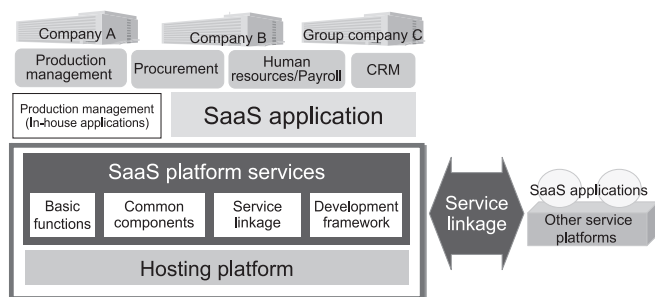
Fig. 10   Hybrid business information system.

References

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previous levels. The service linkage function makes it possible to simplify connections, which tend to become increasingly complicated as the number of linked services increases. The development of applications using the multi-tenant framework can thus reduce the resources consumed in implementation by about 70%.

The SaaS provider can improve the efficiency of the administration of SaaS applications by performing work in accordance with the "standard operation flow" defined by the SaaS platform service. In addition, because the SaaS platform service performs integrated management of application logs and job logs in addition to the logs of the OS and middleware, the SaaS provider can reference the information of multiple logs on the same screen.

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4. Conclusion

In the above, we introduced our SaaS platform service for the efficient implementation of enterprise business systems as services. The SaaS platform service is provided as "RIA-CUBE/SP," which is a common platform service of "cloud" oriented service platform solutions and it is our intension to further enhance this service in accordance to the needs of enterprises with regard to improving their business systems.

We also plan to contribute to the implementation of hybrid type enterprise information systems in which ownership and usage are well balanced; a strategy that is expected to be applied even more in the future (**Fig.10**).

*Silverlight is the registered trademark or the trademark of Microsoft Corporation in the United States and other countries.