

# NEC's Mashup Platform "Open Service Repository/Enterprise Gateway"

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## Abstract

Cloud computing is required to implement services that match user needs quickly and safely by making use of various services from the cloud. This paper describes the features of the "Open Service Repository/Enterprise Gateway," which is the mashup platform of NEC for enabling both the above and the services and solutions that are led from this platform.

## Keywords

cloud computing, mashup, service repository, LCDM, service linkage, data linkage

## 1. Introduction

The use of cloud services is expected to expand further in the future and the main requirements for them includes the customization of the services provided to suit existing jobs, use of multiple services for improving the ease of use for all and the combination of external services with existing on-premise systems. To meet these requirements, expectations are increasing for a mashup technology that can develop new services by combining existing services in a simplified manner. While the most significant features required of the mashup technology are ease of construction and safety of administration, they tend to be hindered by a problem. This is the fact that external services are permanently subject to potential changes that may result in unexpected effects on the system.

To deal with this problem, NEC's mashup (linkage) platform, "Open Service Repository/Enterprise Gateway" (hereinafter referred to as "Enterprise Gateway") localizes the above effects by normalizing the router function. This process converts linked service information into a standard data format (normalization) and then converts the standard data into the data format used by the linkage destination (denormalization) in place of performing individual mashup for each destination. In the following sections, we will introduce the functions and features of Enterprise Gateway and an on-premise linkage solution utilizing the platform functions of the Open Service Repository. In addition, we will also discuss the Enterprise Gateway enhancement program based on the LCDM (Life Cycle Data Management) that enables highly reliable data distribution on the cloud.

## 2. Outline of Enterprise Gateway

NEC's SaaS platform (RIACUBE/SP) consists of; the basic functions, common components, service linkages and development framework as shown in Fig. 1. Here, Enterprise Gateway functions as a service linkage platform.

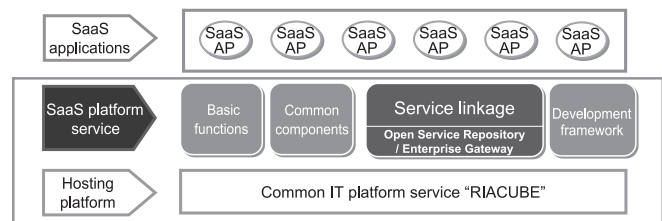


Fig. 1 NEC's SaaS platform.

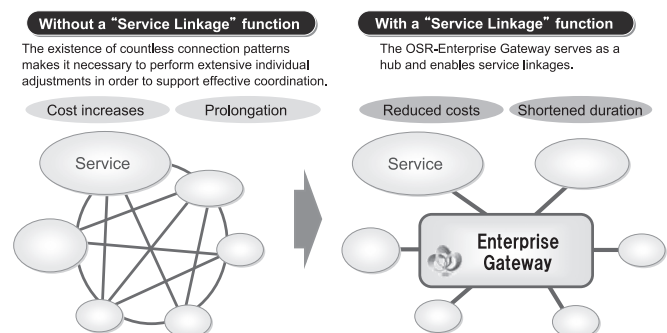


Fig. 2 Role of Enterprise Gateway.

To use mashup as a platform service linkage, Enterprise Gateway provides a user interface mashup function (screen mashup), and another function that links external services and on-premise systems (on-premise linkage).

The service linkage of Enterprise Gateway adopts the standard data of UN (UNCEFACT) for standard messages after normalization. Thanks to the use of normalized data, even when an external service is changed, by simply changing the normalization/denormalization rule it becomes possible to localize the affected range regardless of the number of connection destinations ( Fig. 2 ).

### 3. Screen Mashup Function of Enterprise Gateway

The screen mashup function of Enterprise Gateway is designed for it to be attached externally to a non-modifiable item such as an external service for it to enable customization of the service so that it meets the requirement of the user. This supports construction of customization services optimizations for user requirements by enabling various partial modifications while sharing the services as a whole.

The customization targets of Enterprise Gateway are the web applications that are used most often on the Internet. The customization function is located as a proxy between web applications and the user and various customizations such as extensions of single applications and integration of multiple applications are performed without altering the existing web applications. This process is achieved by analyzing and controlling the GUI data output by the web applications.

In general, a wide range of operations is required for customization. Enterprise Gateway considers customization from three viewpoints; viewing, data model and behavior of existing applications. To achieve such customizations it offers three basic functions; screen conversion, auto execution and data management ( Fig. 3 ).

#### (1) Screen Conversion Function

This function adds, deletes and moves the GUI components by rewriting HTML output using web applications. It is also capable of easily extracting and manipulating data in HTML and rewriting the results. In addition to a simple change of views, the screen conversion can also perform modification of data models in linkages by data management, activity modifications such as changes in linkage destinations with the press of a button and synthesis of multiple applications screens.

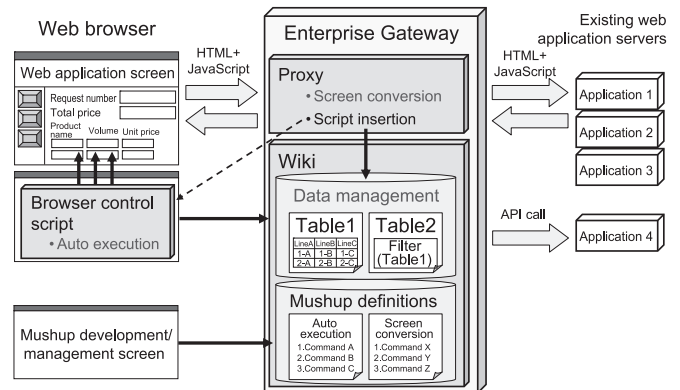


Fig. 3 Mechanism of screen mashup.

#### (2) Auto Execution Function

This function emulates the GUI operation performed by the user on the browser and executes web applications automatically. It can be used mainly to perform activity modifications, such as for skipping the screen transitions of existing web applications, automatic input of information or exchange of data between multiple web applications.

#### (3) Data Management Function

This function retains data required in the mashup processing. It is used for temporary saving of the items newly added by data model modifications, the values to be input by the auto execution function and the data shared by multiple applications.

Customization services based on mashup using Enterprise Gateway are constructed by defining the operations of these three functions.

For example, with the system architecture for screen linkage, the execution platform is composed of three main modules, which are the proxy, browser control script and Wiki modules.

The proxy module acts as an HTTP proxy and relays communications between the browser and web applications. For a specific communication to be customized, it is relayed after applying screen conversion. The proxy also inserts the browser control script.

The browser control script interprets the auto execution definition that is implemented in JavaScript. When auto execution is activated, the interpreter is loaded in the browser together with the web application screen and the operation events such as input and click are sent according to the definitions to the web application displayed on the browser.

The Wiki manages data as well as various customization definitions. The data management includes data retention in

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simple tabular format and table processing such as filtering and sorting. As all of the data and customization definitions are expressed as Wiki pages, it is possible to develop and modify definitions on the web screen and to share definitions among multiple users.

There have already been a number of products for proxy-based HTML conversion, but most of these are capable only of modifying the display screen (view). Also, in spite of there being multiple products for auto execution of web operations, these are introduced for use in saving the labor of users and it has been difficult to provide auto execution as part of the behavior modification service. What is characteristic of the Enterprise Gateway platform is that the integration of the three functions of screen conversion, auto execution and data management has made possible the construction of customization services involving various modifications.

### 4. On-Premise Linkage Solution Utilizing Open Service Repository

The Open Service Repository includes the Service Repository

used as a platform by Enterprise Gateway. The Service Repository manages the information that is interfaced with external services and thus becomes a fundamental function of service linkages. This on-premise linkage solution utilizes the Service Repository for easy linkage between services on the cloud and on-premise applications. This solution can link to the services created on the Force.com platform of salesforce.com, Co., Ltd. or to any on-premise mission-critical system as described below.

This solution implements mashup between on-cloud applications and on-premise applications by using the Internet Information Server that is a Windows server and with NET Framework environment as the platform.

The currently provided version uses the BAPI when the on-premise mission-critical system uses a SAP application and the views and tables of Oracle or SQL Server when the system uses other applications. It transfers arbitrary data in the mission-critical system to Force.com on the cloud so that it can be handled as a custom object by the applications on Force.com. This solution provides the following two functions.

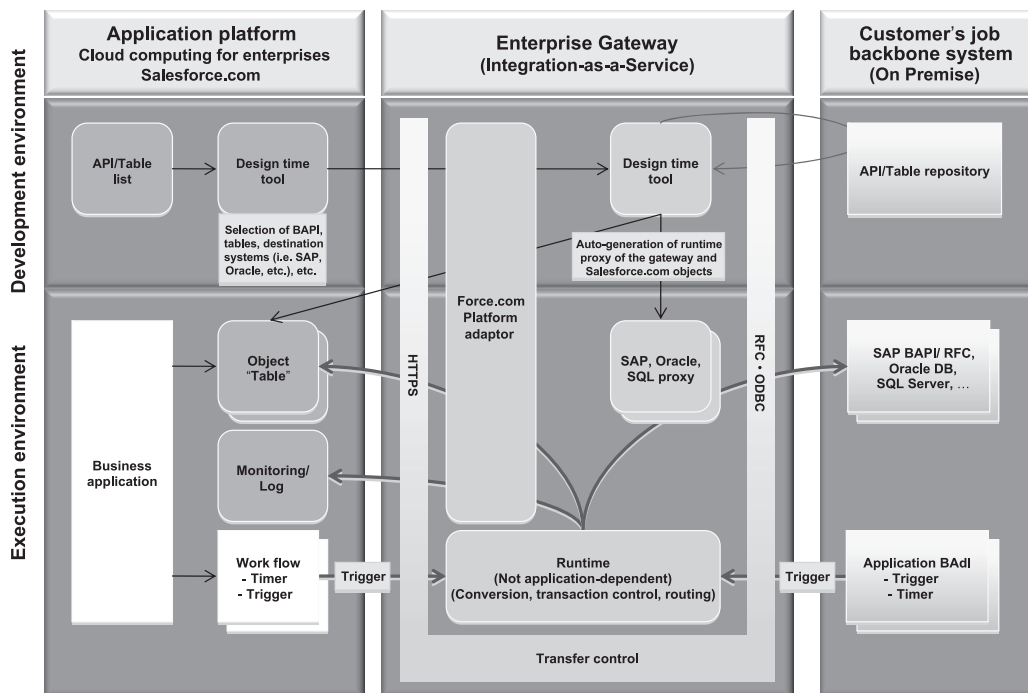


Fig. 4 Mechanism of on-premise linkage.

**(1) Design Time Function**

By defining connection information for the on-premise application to connect it to the Force.com, public interfaces for the on-premise application (BAPI with SAP or thevia views and tables with Oracle/SQL Server) can be acquired.

When a scenario is created by selecting desired items (method names, table names and item names) from the interface information, the synchronization logic and custom objects are generated automatically.

**(2) Runtime Function**

This function executes the scenario generated in the design time at the occurrence of an event such as a trigger or timer activation. In consideration of the governor limits<sup>\*1</sup> appropriate to Force.com, the data linkage in runtime can automatically be divided into multiple processing operations and may be executed asynchronously so that every processing operation can be completed within the defined limits ( Fig. 4 ).

In the future, in addition to Force.com we are planning to support Microsoft SharePoint Server and NETSUITE as suitable platforms for linkable cloud applications.

**5. Enhancement of Enterprise Gateway Based on LCDM**

As systematization is promoted in various organizations, the amount of digitized information (data) has been increasing exponentially. The current situation is further affected by the arrangement of communications infrastructures; leading thus to an increase in the amount of data easily available from websites, etc. However, the data formats vary greatly and their efficient use has been difficult because the specifications and acquisition methods were often unknown.

In addition, since the data on cloud is updated every second, there are important risks related to the quality of data used by systems due to freshness deteriorations as a result of data alterations, etc. To solve this issue, the application of IT in data management is in progress in the USA and Europe ( Fig. 5 ).

In Japan, too, research into a mechanism adopting the concept of data management has been started under governmental leadership as one of the measures for forming the core of the next generation IT endeavors ( Fig. 6 ).

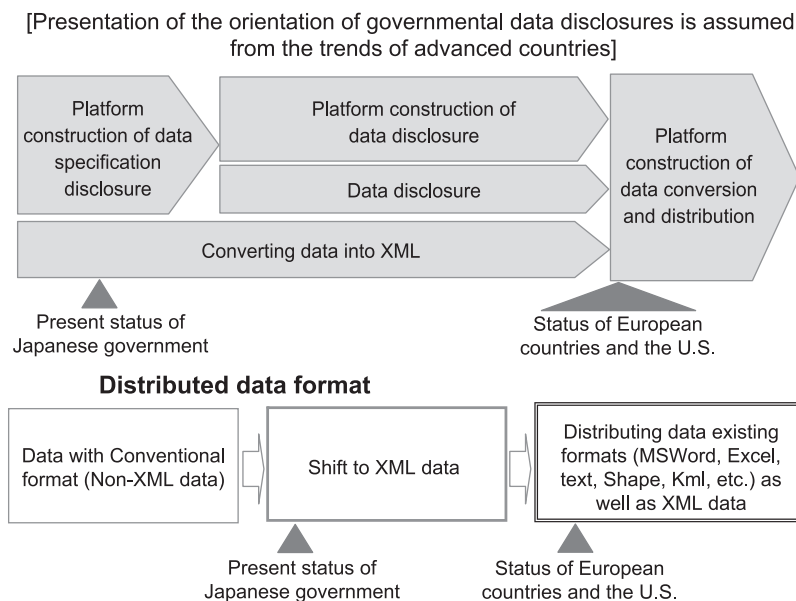


Fig. 5 Data linkage promotion situations of various countries.

\*1 Governor limits: Limits per user applied to secure multitenancy with Force.com. Fine rules are defined including the number and size of handleable data records, the number of processing repetitions, etc.

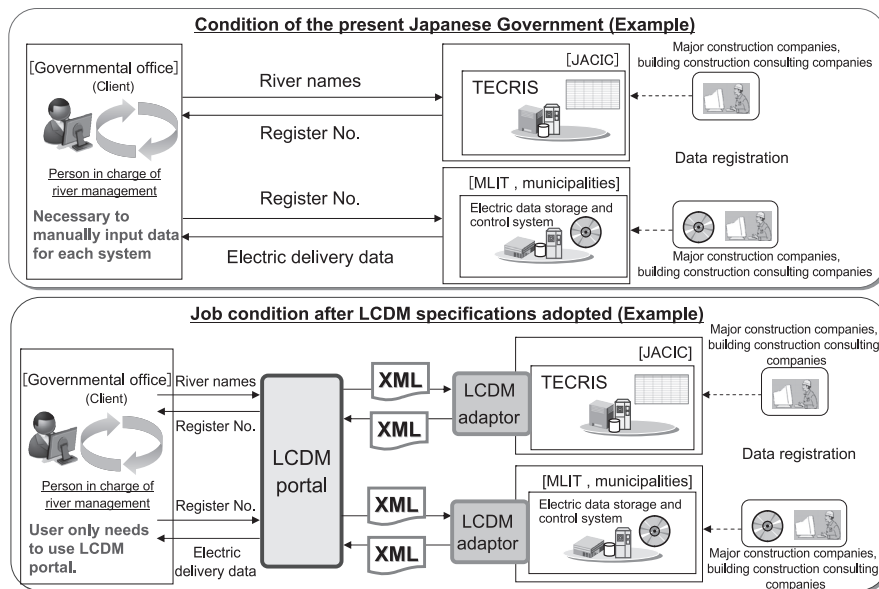


Fig. 6 Example of a data linkage study by Japanese Government.

At NEC, we participated in the LCDM Forum<sup>\*2</sup> in order to contribute to the establishment of its specifications, and we are also planning to provide Enterprise Gateway with a data linkage function based on open specifications as studied in the LCDM Forum. This function will allow a corporate system to connect itself to the LCDM adaptor service on the cloud and to distribute information that can be opened easily on the cloud. Users may receive such data from the portal service on the cloud, understand the data based on the data specifications, and process/convert the data from the users' viewpoints for the effective use of data for themselves.

In addition, referencing the data specifications and management information on the LCDM registry makes it possible to secure an acceptable data quality in terms of freshness and alterations.

## 6. Conclusion

The mashup function provided by Enterprise Gateway can localize the effects of modifications of individual systems by connecting to the cloud services that are difficult to be cus-

tomized according to customer requests via a normalizing router. It achieves advanced screen mashup that is not found among competing platforms by combining the screen conversion, auto execution and data management functions.

In the future, we intend to enhance our product by improving its mashup function and by thus making the platform easier and safer to be used.

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<sup>\*2</sup> LCDM (Life Cycle Data Management) Forum: A non profit making task force led by Japanese private companies, organized with the aim of developing LCDM data distribution specifications so that they contribute to the establishment of the infrastructure of Japanese information economy society and to promoting their use.

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The details about this paper can be seen at the following.

**Related URL:**

**RIACUBE/SP:**

**<http://www.nec.co.jp/outsourcing/saas/kiban.html>**

**Open Service Repository:**

**<http://view.openservicerepository.com/>**