

SaaS Virtualization Method and Its Application

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Abstract— In this paper we propose a method and its application to construct the information system for a company that needs the cloud computing services. The points of this method are coupling the advantage of cloud computing service provided by the telecom operators and SaaS vendors. Specifically, we discuss about “SaaS virtualization method”. This method is combine together the SaaS base service system and on-premise backbone system with VPN as a closed area network. By introducing this method, it is possible to combine virtually the SaaS base service system that was assigned to each client company existing externally and the on-premise backbone system. That is, the external SaaS base service system and the internal backbone system are unified by virtualization. In addition, we think the “SaaS virtualization method” may have a possibility of becoming a Business to Business to X (BtoBtoX) model to address the needs of client company through combining the core competency of each of multiple cloud service companies as one way of combining technology and business.

Keywords—SaaS, On-premise Backbone system, VPN, virtualization, security, Business to Business to X (BtoBtoX) model

I. INTRODUCTION

Telecom operators began to take the internet business as a new business category after the internet emerged around 1990. Thereby telecom operators became to supply the business environment beyond the national border. In such a circumstance, the Internet connects the world and changes the world to one huge platform. As a result, an independent company that is different from telecom operator has supplied various information business. Cloud computing is one of the representative information business.

In this paper, we discuss about how the Japanese telecom operator should offer the cloud businesses. Specifically, the telecom operator is seeking the safety of communication in offering the cloud computing services. On the other hand, the companies that are offering SaaS services [1] (hereafter, SaaS vendor) are pursuing the economy of scale and convenience

by making use of characteristic of cloud computing [2] to the maximum. This SaaS market is occupying about 50% share of cloud computing market size.

In this paper we propose a method and its application to construct the information system for a company that needs the cloud computing services. The points of this method are coupling the advantage of cloud computing service provided by the telecom operators and SaaS vendors. In addition, we describe about a prospect of future deployment of the author's method.

II. Current issues

A basic merit of cloud computing is “Reducing development and operation cost”. An article of Japan Users Association of Information Systems [3] reports “Quick grasp of business and information” and “Streamlining of business process” are available by introducing cloud computing. This paper discusses the issues described here for the sake of client companies.

These companies require expansion and advancement of function of existing on-premise system (backbone system constructed and operated in house) in order to realize these needs.

On the other hand, SaaS vendor want to impound many client companies as taking advantage of economy of scale by constructing his own SaaS system on Internet. In order to realize it, SaaS vendor need to solve the security issue [4] which client company have concerns in utilizing the SaaS service.

Telecom operator is providing End-to-End cloud computing services taking advantage of its strength of possessing the network. In order to be selected the telecom operator's cloud computing service by client company, telecom operator needs to add a high value to network services.

Difference in policy and issue by the different third party's stand point described above is shown in Table-1.

Table-1 Policy and issue in respective standpoint

	Telecom operator	SaaS vendor	Client companies
System policy	<ul style="list-style-type: none"> Provides overall network services 	<ul style="list-style-type: none"> Constructs own SaaS system and deploy services on Internet. 	<ul style="list-style-type: none"> Constructs a backbone system in secure environment
Business Policy	<ul style="list-style-type: none"> Provides End-to-End network services Pursuing the security of communication 	<ul style="list-style-type: none"> Pursuing economy of scale Pursuing convenience Impounds as many companies with needs as possible 	<ul style="list-style-type: none"> Quick grasp of business and information Streamlining of business process Cost reduction
Issue	<ul style="list-style-type: none"> Adding a high value to network service 	<ul style="list-style-type: none"> Enforcing security of communication 	<ul style="list-style-type: none"> Function expansion and advancement of on-premise system Enhancement of cooperation between systems

III. SaaS virtualization method

Main object of this paper is to present system structures to meet the different policies by respective standpoint described above and to solve the respective issues. In general, two systems existing in the different network spaces work separately and the accumulated information cannot cooperate each other. This means that the SaaS base service system and on-premise backbone system existing in the different network spaces operate independently and the information cannot be

shared.

So, we propose here “SaaS virtualization method” (Fig.1). This method is to connect between the SaaS base system and the on-premise backbone system with VPN of closed area network. Through realizing this method, it becomes possible to connect the SaaS base service system assigned to each client company existing externally to the on-premise backbone system existing internally. That is, the external SaaS base service system and the internal backbone system are combined together by virtualization.

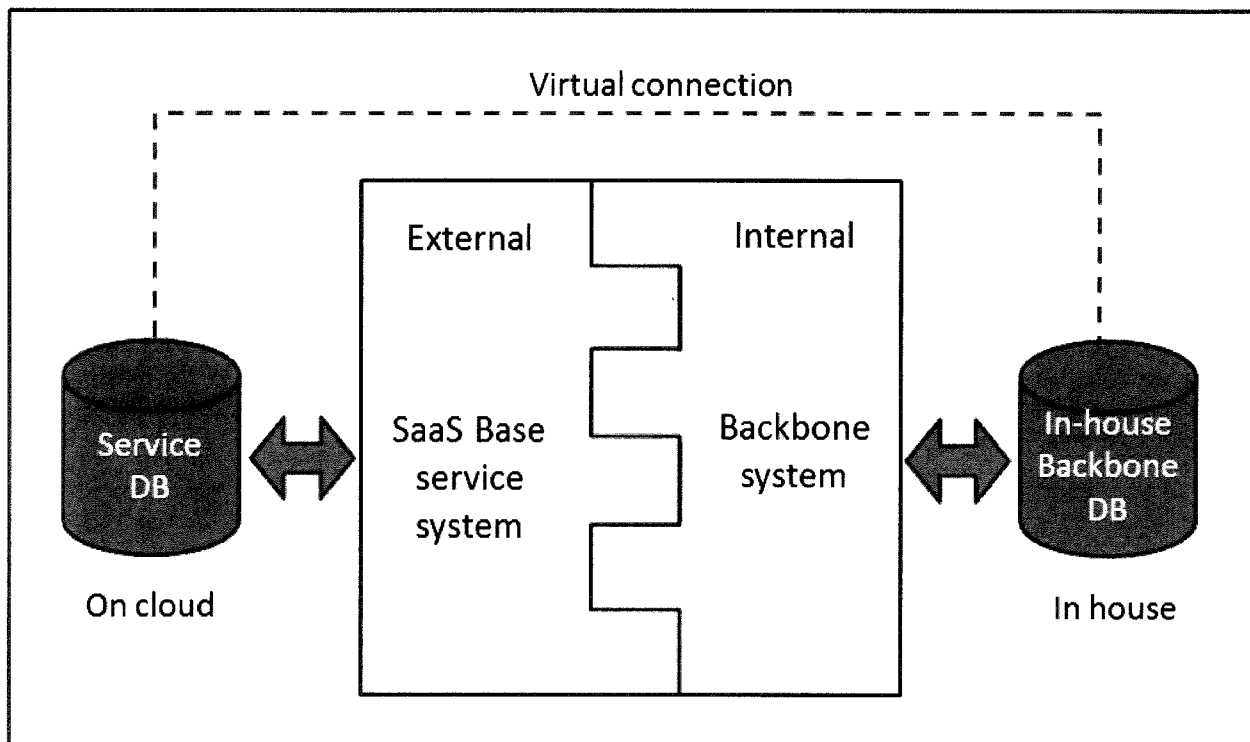


Fig.1 SaaS Virtualization Method Integrates external SaaS service and internal system into One

Next we describe about realization method of SaaS virtualization method.

IV. Salesforce over VPN for realizing “SaaS virtualization method”

As a method for realizing “SaaS virtualization method”, we introduce “Salesforce over VPN” model in “Arcstar Universal One Gateway for Service Provider” [5] services provided by NTT Communications (hereafter, NTTCom) as a realization method of “SaaS virtualization method”. This “Salesforce over VPN” is a cloud service that enables client company to utilize SaaS service assigned through secure VPN network by constructing the commercial application type cloud service offered by Salesforce Inc. on the SaaS basic service offered by NTTCom.

This service realizes secure connection by connecting three different network spaces; on-premise backbone system’s network space of client company, the network space of Salesforce Inc., and the network space of gateway that combines the former two network spaces. That is, the external SaaS base system and the internal backbone system are securely combined together by connecting these three different networks each other by virtualization. By the realization of this method, use company can be utilized of SaaS-service assigned by Salesforce company as on-premises. This realization model is shown in Fig.2.

We will describe the details of the communication of this model using an example shown in Fig 3. IP packet sent from the on-premise system has the source IP address (1), and the destination IP address (2) of the on-premise side of the NAPT GW system, and the port number is 1000. When the IP packet reaches the NAPT GW system, NAPT GW system rewrites these information, the source IP address, source port number and destination IP addresses. For this, the source IP address is rewritten from (1) to (3) of Salesforce side of NAPT GW system, and the source port number is rewritten from 1000 to 3000. The destination IP address is rewritten from (2) to (4) of Salesforce system. Salesforce system receives the rewritten IP packet, and reply the IP packet to the NAPT GW system. For this, IP packet sent from the Salesforce system is the source IP address (4), and the destination IP address (3) of Salesforce side of the NAPT GW. When the IP packet reaches the NAPT GW system, NAPT GW system transfers it to the on-premise system. For this, the source IP address is rewritten from (4) to (2) of the on-premise side of the NAPT GW system. The destination IP address is rewritten from (3) to (1) of the on-premise system, and port number is rewritten from 3000 to 1000. The on-premise systems receives the reply packet from the Salesforce system.

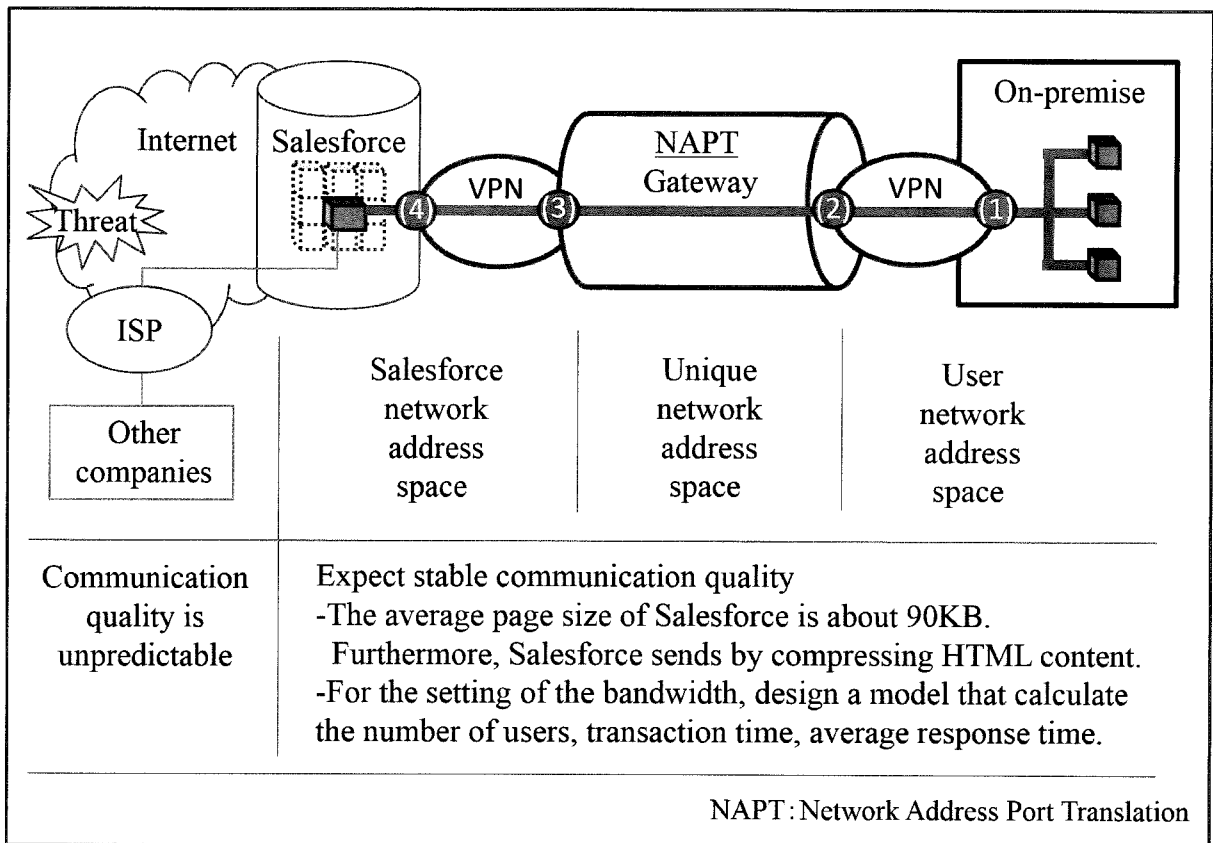


Fig.2 Construction of security environment by combining three different network spaces

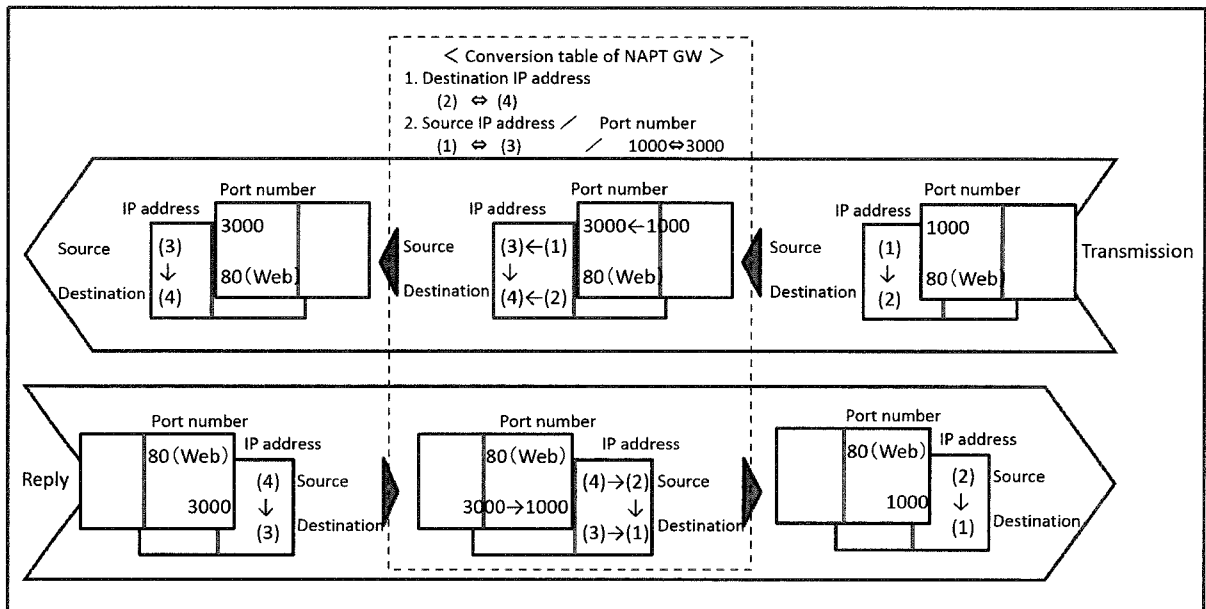


Fig.3 Details of the communication of this model

Next we present the introduction effect of “SaaS virtualization method” using an example

V. Application example of “SaaS virtualization method” by “Salesforce over VPN”

Tokyo Metro Corporation hoped for constructing a CRM (Customer Relationship Management) system possible to

quickly respond to inquiry from users. Needs in constructing the system were to realize a shift not to be accompanied by the stop of duties, to accumulate inquiry information from various information channels such as Web, telephone, and e-mail, to realize interlocking with backbone system, and to establish high security and reliability. Targeting at solving these requirements, Tokyo Metro decided to construct the CRM system using the “Salesforce over VPN” (Fig.4).

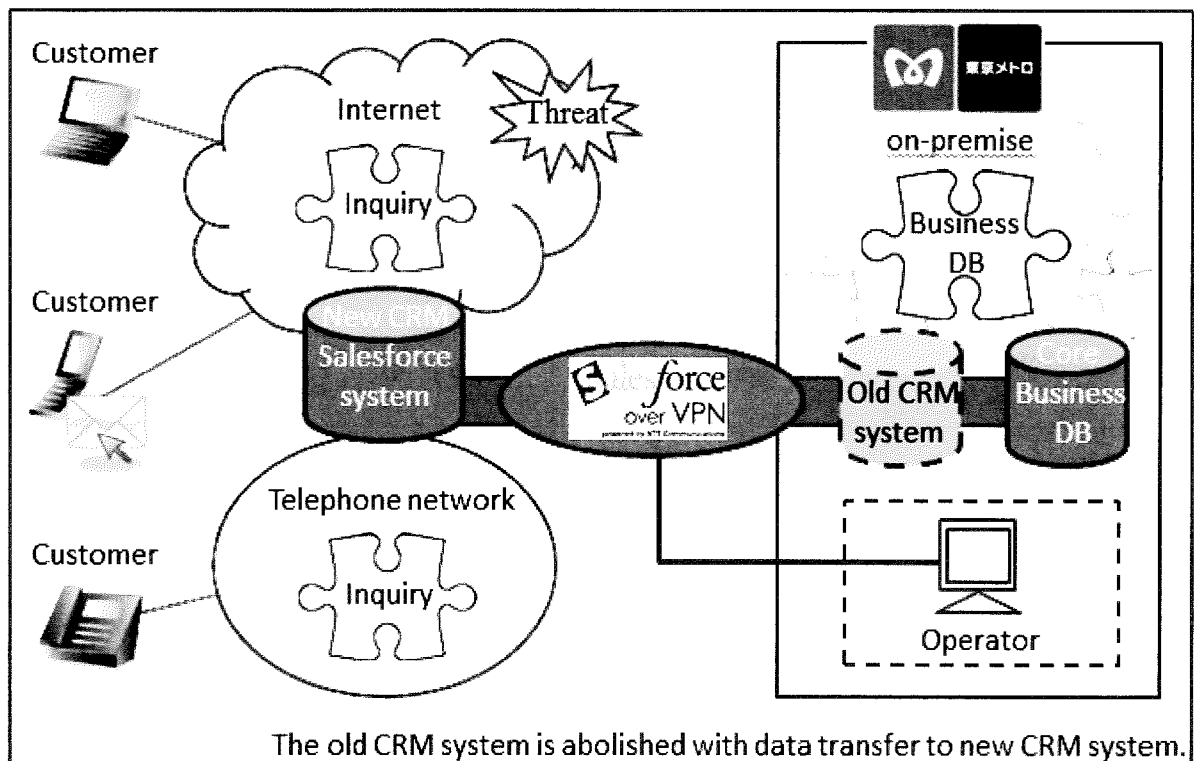


Fig.4 Application example of SaaS Virtualization method by Salesforce over VPN

As introduction effect, it is said that “high security” was realized through connection with closed area network in shifting database from existing CRM system to new CRM system of Salesforce over VPN. At the same time, transition was completed only within night-time after the duties end.

In addition, through realization of cooperation between new CRM system of Salesforce over VPN and the backbone system, response efficiency to users was improved, for example, registered information in new CRM system at the time of four months passed since the start of full operation (at the time of 2015.4.30, under confirmation) has increased by three times from the value when transition was executed. As the result, when an inquiry occurred from registered users, information of users became to be popped-up automatically, and convenience and effectiveness were greatly improved [6]. Introduction effect describes above is shown in Table-2.

Table-2 Introduction effect of Salesforce over VPN

Introduction effect	
i.	• Realized “High security” by connecting the external Salesforce and the internal backbone system with closed area network.
ii.	• Completed transition of business data only within night time after the duties end by virtually combining with the backbone system.
iii.	• Response efficiency was improved by combining the external and the internal systems, resulting in three times increase of registered data.
iv.	• Business effectiveness was improved by advanced business database through the combined whole system (automatic pop-up, etc.)

This example clearly demonstrates that it is possible to realize secure combination of the external SaaS base service system and the internal backbone system through introduction of Salesforce over VPN by client company.

That is an essence of “SaaS Virtualization method” and also very effective for business.

VI. Evaluation

We confirmed the effectiveness of “SaaS virtualization method” based on application example of “Salesforce over VPN”. The content was to solve the requirements that client company has such as to accumulate inquiry information from various information channels such as Web, telephone, and e-mail, to realize interlocking with backbone system, and to establish high security and reliability with a technology to combining virtually the Salesforce and the on-premise backbone system by VPN.

This “SaaS virtualization method” can be easily realized by combining the existing technologies. It was known that, by realizing this method, security can be reserved and reliability of whole system looked from the viewpoint of client company becomes higher.

Besides, it was known to be possible to realize expansion and advancement of backbone system’s function through becoming possible to combine together the service systems that exist in different network spaces (Internet and on-premise network). From evaluation of application example, we confirmed that the “SaaS virtualization method” is effective.

VII. Future perspective

In this study, we discussed about “SaaS virtualization method”. This method is combine together the SaaS base service system and on-premise backbone system with VPN as a closed area network. By introducing this method, it is possible to combine virtually the SaaS base service system that was assigned to each client company existing externally and the on-premise backbone system. That is, the external SaaS base service system and the internal backbone system are unified by virtualization.

As for evaluation of “SaaS virtualization method”, we picked the application example of “Salesforce over VPN”. We introduced the example of addressing to need on business of Tokyo Metro Company in which the issue was solved by securely and virtually unifying the Salesforce and the on-premise backbone system with VPN, and it was known that this method is effective also in business aspect. It can be considered that this is the result of adding a viewpoint to realize function expansion and advancement of backbone system’s function by combining SaaS system existing on open Internet and the on-premise system, and to create a new value of information treated on such system, in other words, the result of a new viewpoint of “Economy of information connection” was added [7].

Basic structure of “Salesforce over VPN” as a product service of NTTCom is opened as “SaaS over NGN” in “NTT Technical Review” document [8].

“SaaS over NGN” is a service concept including “Salesforce over VPN” to construct secure communication network by combining various system distributing in different networks with closed area network.

Therefore, it is thought that there exists “SaaS virtualization method” proposed in this article in the essential concept of “SaaS over NGN”. In this paper, we picked up Tokyo Metro Company as an application example, but other application examples are also being implemented. We are expecting that “SaaS over NGN” is widely introduced in the future by evolving this method.

Finally, we think that the “SaaS virtualization method” may have a possibility of becoming a Business to Business to X (BtoBtoX) model to address the needs of client company through combining the core competency of each of multiple cloud service companies as one way of combining technology and business, that is to address not only the information system related needs but also the business needs.

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