

Portal Services Integrate Multi-Cloud Environments

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Abstract

The drastic expansion in the IaaS market has recently resulted in emergence of many cloud-based services provided by IT vendors. These cloud-based services cover a variety of configurations such as public and private services, and some services adopt several of these configurations and actively build hybrid cloud/multi-cloud environments. The issues posed for customers due to cloud system implementations now include the need for appropriate cost reductions, enhanced security and the integrated operation management of the multi-cloud environment.

This paper discusses the portal services based on the NEC Cloud IaaS that are being developed in order to resolve these issues.



cloud-based services, hybrid cloud, multi-cloud, IaaS, security, monitoring, Zabbix

1. Introduction

After its entry into the popularization era, the IaaS market has grown at such a rate that many providers now offer cloud-based services (infrastructural services such as the IaaS and PaaS) that allow customers to run their own business applications. Among them, the Amazon Web Services (AWS) is a cloud-based service (public cloud) that because of its low price and high usability now leads the industry in terms of user service content. Another configuration of the cloud-based services, the private cloud is adopted by individual enterprises in order to build in-house cloud environments. Customer enterprises must combine various cloud-based services according to their individual needs (hybrid cloud/multi-cloud environments).

Based on the background as described above, we introduce below the portal services for integrating the multi-cloud environments that have been developed based on the cloud platform service “NEC Cloud IaaS” (NECCI), which aims to solve the issues posed for enterprises that adopt the use of cloud-based services.

2. Issues Accompanying the Cloud Implementation of Corporate Information Systems

The increase in awareness of the cloud-based services has enhanced the interest towards the use of cloud-based services among enterprise users. As expressed by the term “cloud first”, these users almost always consider the utilization of cloud services in any attempt to create new business systems. Nevertheless, not a few businesses having once considered the use of the cloud-based services have subsequently rejected them. This is because of the following issues that tend to accompany the use of cloud-based services.

Issue 1: Can the use of cloud-based services ensure appropriate cost reduction?

Issue 2: Can the use of cloud-based services maintain the availability and confidentiality required by a business system?

Issue 3: Can integrated monitoring and operations management of a system that combines on-premise and cloud-based systems be performed efficiently?

Some of the most frequent causes of rejecting the use of cloud-based services are related to cost. These may be the “high charge of cloud-based services” or the “high cost of switching

to a cloud-based system.” What an enterprise expects mostly from cloud computing is a cost advantage, a characteristic that is actually indicated by an increase in the severity of competition in the IaaS market.

For the availability and confidentiality of Issue 2, what the customer needs from the cloud-based services after cost reduction is the freedom from anxiety that is related to network security. This issue is a question of trade-off between cost and quality.

Issue 3 is related to the “hybrid cloud/multi-cloud environment.” The demands for services that enable integrated mutual linkages between systems and their integrated monitoring and operation management are increasing. This trend applies even in environments with mixed IT platforms, such as the ones using the public cloud systems in order to reduce costs and the on-premise systems for handling confidential data.

3. Solutions Using NEC Cloud IaaS

The NECCI solves the issues described above by providing various services including the IaaS service. The solutions offered by the NECCI as countermeasures to these issues are as follows.

3.1 Solutions for Issue 1

- **Operating cost reductions for the various monitoring/operation menus**

The Self-Service Portal provided by the NECCI is capable of 24-hour, 365-day monitoring of the live status of servers and network devices, resources, processes and applications (log monitoring). The monitoring services available with the NECCI are listed in **Table 1**.

The user can control and execute the monitoring setting, apply careful supervision, registration/modification of auto notification addresses and other functions on their Self-Service Portal. This means that there is no longer a need to conduct construction and modifications based on coordination with the concerned persons of other en-

Table 1 Monitored items of NEC Cloud IaaS.

Services	Alive status monitoring	Port monitoring	Resource monitoring	Log monitoring	Process monitoring	NW device monitoring
Monitored items	Server (physical and virtual) housing devices, housing equipment	Specified ports, ports, Web	CPU utilization Memory utilization Disk utilization	Syslog Event log Specified logs	Specified processes Specified services	SNMP Trap MIB
Monitoring interval	1 min. (default) to 10 min.	10 min. (default) to 20 min.	5 min. (default) to 20 min.	5 min. (default) to 20 min.	5 min. (default) to 20 min.	5 min. (default) to 20 min. MIB
Alert notification address	Arbitrary mail addresses (max. 10 addresses)					
Monitoring data storage period	13 months					

terprises or departments. The integration or operation of systems or the preparation of an individual monitoring system for each user or project as with the traditional system is not now required.

Additionally, the functions for routine operation, configuration information (data on nodes and resources) collection and incident management are provided to contribute to the reduction of costs related to the system construction and customer operation.

3.2 Solutions for Issue 2

- **Maintenance of security using various security option services**

The NECCI provides various security option services. Customers can improve security by selecting and introducing the required security option services according to their systems. The intrusion monitoring service builds a intrusion surveillance system for monitoring packets that invade the user’s network by passing through the firewall. When a intrusion alert is detected, the security operation center (24-hour, 365-day system) notifies the user and takes emergency measures. The ID & access management service prevents illegal behavior of system operators by managing the accesses and trails when a system administrator performs a system operation using a privileged ID. When an operator wants to access the system, the operator must apply for an access permission in advance in order to obtain approval from the system manager. All of the operations from login to logoff are recorded in the log so that any illegal inside jobs can be prevented.

- **Privilege separation based on user role definitions**

The Self-Service Portal defines roles of each service user. Service users can then operate the system with the appropriate authority according to the operations management system and the privileges granted to different departments inside the organization. Roles include that of the “tenant manager” who has the authority to approve the various applications and to make decisions concerning the introduction and modification of services, the “manager” who can approve applications upon prior authorization by the tenant manager and the “operator” who proceeds application operations and conducts the actual work. These roles can be set within each tenant. In addition, the “general operations manager” is also defined as the role given for sales engineers dealing with customers and for SEs.

- **Range of IaaS services for selection according to availability requirements**

The NECCI defines two levels of services, the “Standard (STD)” and “High Availability (HA)” services and defines the target service levels (availabilities) for them, such that customers can select services according to the

availability requirements of their systems.

The High Availability (HA) service places emphasis on the availability, set redundancies and multiplexing of physical servers, storages and hypervisors (redundancy of server disk I/O paths). In order to minimize periods of service interruption due to faults the RAID (Redundant Array of Inexpensive Disks) configuration of storage disks is also emphasized.

3.3 Solutions for Issue 3

- **Contribution to integrated system management and to the cost reduction of hybrid cloud and multi-cloud environments**

The NECCI provides functionalities for the integrated

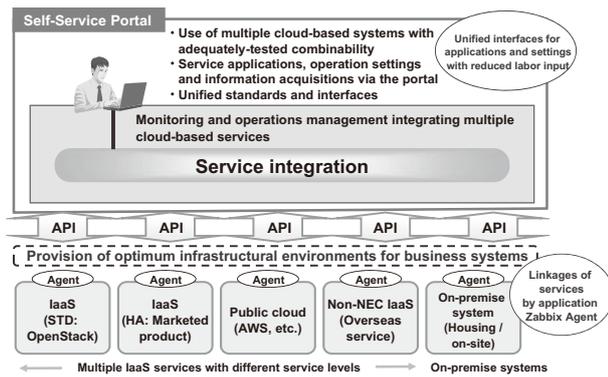


Fig. 1 Integrated management in a multi-cloud environment.

management and operation of not only those services offered on the NECCI but also of build systems based on non-NEC cloud-based services and non-NEC sites. It is capable of integrated management of multiple cloud environments such as the public cloud using the AWS, an on-premise system or a private cloud system. Specifically, it allows system monitoring, configuration management and incident control of these different cloud environments via the unified standards and interfaces of the Self-Service Portal (Fig. 1).

4. Technologies for a Self-Service Portal

In addition to the features described above, the Self-Service Portal also allows users to browse, control and manage tenant and billing information as well as the resources used by the tenants (specifications, quantities and status of virtual machines and networks). Table 2 shows the basic functions provided by the Self-Service Portal.

The Self-Service Portal utilizes various tools for providing these services and functions. Below, we describe the technologies and software that we have utilized in designing the framework for the Self-Service Portal and its monitoring and operation management functions.

(1) Web-MVC model

The Self-Service Portal has a hierarchical configuration composed of the Presentation layer, Business Logic layer and Automation layer. Its architecture conforms to the Web-MVC (Web-Model View Controller) model (Fig. 2). The Model layer employs the Skinny Controller and Fat

Table 2 Basic functions of Self-Service Portal.

Function names	Description	
Dashboard function	Display of notices, incident situations, billing situations and operation/work situations	
Application function	New application and approval/confirmation of applications	
Tenant information functions	Tenant information	Display of tenant information
	User management	Management of portal users
Billing functions	Billing list	Display of billing list over several months
	Billing details	Display of billing details per month
	Tariff	Display of price list
Resource management functions	Server management	Virtual server management, addition/deletion of SSH keys
	Storage management	Settings of file storages
	Network	Settings of virtual LAN, firewall, load balancer and bandwidth control
Monitoring/operation management functions	Monitoring settings	- Addition, modification and deletion of monitoring and notification settings - Display of monitoring type, monitoring interval and abnormality detection count per monitoring setting
	Remote operation management	- Addition, modification and deletion of remote operation settings - Display of remote operation settings such as the server restart count
	Incident management	- Registration, modification and deletion of incidents including work requests, fault notices and inquiries - Display of incident list
	Operation logs	Display of logs of server start, remote command execution, etc.
	Resource utilization situations	Display of utilizations of CPU, memories, disks, etc.
Report display	Display of incident report and resource report	
Password reissue function	Reissue of passwords	

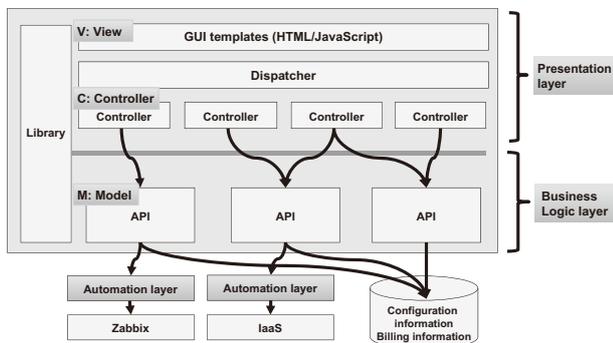


Fig. 2 Architecture of the self-service portal.

Model methods for embedding the business logic. The View/Controller section and the Model section are located in a separate server to enable scaling out.

(2) **Zabbix**

This software monitors the NECCI components as well as the equipment of other cloud-based services and on-premise/housing equipment. It is an Open Source Software (OSS) that has agents running on various platforms, it is compatible with the SNMP, and it is used very often in the cloud-based business industry. However, instead of the employing the Zabbix user interface, service users can modify and delete monitoring settings on the Self-Service Portal, which is designed to be easy for users to understand.

(3) **Redmine**

This software is used for managing the tickets for work requests, fault notices and inquiries. It is an OSS developed by Ruby on Rails, and is seen frequently in the cloud-based business industry.

(4) **Mule ESB**

Mule ESB is used as a framework for implementing orchestrations. It is an OSS developed by Java and used as a framework for application integration/linkage.

5. Conclusion

As described above, the Self-Service Portal of the NECCI controls not only the IaaS services but also provides the functionality for improving the efficiencies of SI and for outsourcing businesses.

Additionally, it provides a function as a dealer Self-Service Portal for facilitating sales from dealers or sales by OEM, and it also provides function which offers the Express 5800 series by packaging the right of usage of the NECCI for three years as well as that for supporting the cloud-based provision of software.

The Self-Service Portal of the NECCI contributes to the growth and innovation of customers' businesses by bringing

about reforms in the method of delivery of IT services and products as described above.

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