IaaS Automated Operations Management Solutions That Improve Virtual Environment Efficiency

KATSUURA Keita, MIYAUCHI Mikio, NUMAZAKI Takeshi, KUROGOUCHI Yuuji, SATOH Yasunori, KOSEKI Takayuki

Abstract

Although new technologies for allocating virtual IT resources and automating operations management are increasingly being introduced in data center environments, the network environment is incapable of following them, making it impossible to perform efficient operations management based on integration of IT and networks.
This paper introduces an automation solution for improving the efficiency of IT and network operations management in an IaaS environment. It implements integrated network environment management by introducing UNIVERGE PF1000 and UNIVERGE PF6800 (OpenFlow), which apply OpenFlow technology to Hyper-V virtual switches, and additionally achieves integrated control with Microsoft System Center.

Keywords

UNIVERGE PF series, UNIVERGE PF1000, Cloud, IaaS, virtualization, Hyper-V, SDN, OpenFlow

1. Introduction

In the Japanese domestic server market, 2012 was the first year in which shipments of virtual machines exceeded those of physical servers. Virtual machine shipments are expected to increase to about 1.75 million units in 2016, which is about 2.5 times the 2012 level of 0.7 million units, while shipments of the virtualized servers driving virtual machines are expected to remain at the same level. Meanwhile, expenses for private cloud systems in the Japanese market are expected to reach 1,412.9 billion yen in 2017, which is about 4.4 times larger than the 321.1 billion yen of 2012.

As seen above, it is expected that corporate customers will increasingly administer data centers by themselves, using increasingly virtualized servers. This leads to the need for an efficient means of operations management for a huge amount of virtual IT resources, which are also expected to continue to increase. SDN (Software-Defined Networking) is attracting attention as a technology for responding to such a need.

This paper introduces a solution for increasing the operating efficiency of data centers built using Microsoft's Hyper-V virtualization platform by integrating the operations management of virtualized environments based on interlinking between the NEC UNIVERGE PF Series and Microsoft System Center 2012 R2.

2. Issues for Operations Management in a Virtualized Environment

With current ICT systems, the functions and roles of IT devices and network devices are separate and each device is managed by either an IT manager or a network manager. As a result, operations are sometimes performed in series by several persons. For instance, if a virtual machine is faulty and must be isolated from the network, the IT manager detects the fault, decides on isolation and notifies the network manager, who performs the actual isolation of the machine from the network. Such processes involving more than one person are possible with a small-scale ICT system. However, in systems like data centers in which IT resources are expected to increase considerably in the future, we believe it would be difficult to manually manage perform operations of an ICT environment by more than one person.

3. Outline of the Solution

The solution proposed here makes possible the construc-

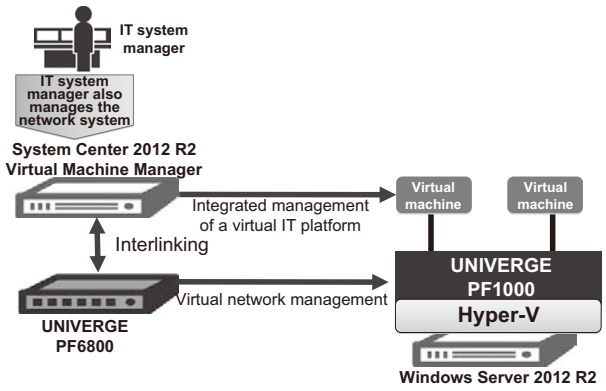

Fig. 1 Outline of a solution using SCVMM.

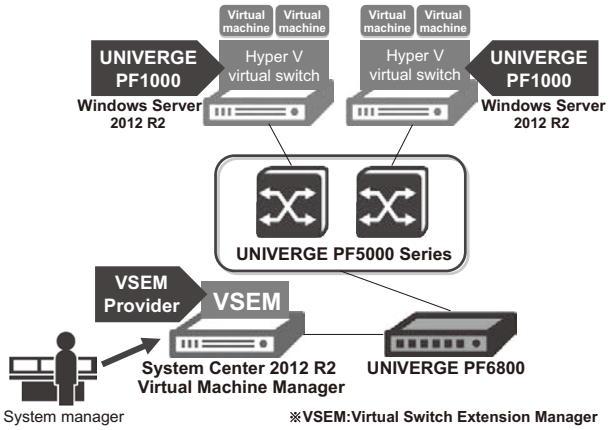

Fig. 2 Outline of a solution for virtual network platform control.

tion, setting changes and operations management of an OpenFlow-compatible virtual network and virtual IT system based on the UNVERGE PF Series in a data center environment in which the virtual ICT platform is built using Hyper-V environment from the System Center 2012 R2 Virtual Machine Manager (SCVMM).

With this solution, the IT system manager is capable of the construction and operations management of a virtual network environment, as well as a virtual IT environment, using the SCVMM already familiar to him or her (**Fig. 1**).

When the UNIVERGE PF1000 extension software with OpenFlow extensibility (to be detailed later) is applied to the virtual switches used with Hyper-V, control using the OpenFlow protocol becomes possible from UNIVERGE PF6800 (OpenFlow Controller).

This makes UNIVERGE PF6800 capable of managing virtual networks as well as physical networks.

To implement virtual network control from the SCVMM, Microsoft Corporation and NEC jointly developed VSEM (Virtual Switch Extension Manager) Provider, a plugin for controlling UNIVERGE PF6800 for the SCVMM. Applying VSEM Provider to the SCVMM makes it possible to control virtual networks through UNIVERGE PF6800 (**Fig. 2**).

4. UNIVERGE PF1000

To improve the operations management efficiency of Hyper-V virtual networks using SDN technology, we developed the UNIVERGE PF1000 extension software, which is capable of OpenFlow extension of Hyper-V virtual switches (Hyper-V Extensible Switches).

The Hyper-V Extensible Switch is designed to allow vendors other than Microsoft to extend functionality so that they can add transfer, filtering and/or surveillance functions to virtual switches (**Fig. 3**).

The UNIVERGE PF1000 software (**Table**) uses these extension functions and implements an OpenFlow-compatible virtual switch. The use of the UNIVERGE PF6800 makes it possible to manage Hyper-V virtual switches in addition to UNIVERGE PF series physical switches so that the OpenFlow protocol becomes capable of integrated management of both physical networks and virtualized networks.

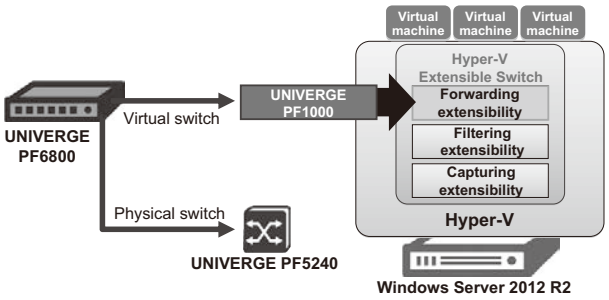

Fig. 3 Outline of UNIVERGE PF1000.

Table Main specifications of UNIVERGE PF1000.

Item	Specifications
OS	Windows Server 2012 R2 Datacenter Edition
HDD space required for installation	128 MB
OpenFlow protocol	OpenFlow 1.0 compliant
Max. number of virtual switches	256 switches per server
Max. number of ports	1,280 ports per virtual switch (total of VMNIC, VNIC and physical NIC)
Max. number of virtual ports	1,280 VMNIC ports and 1 VNIC port per virtual switch
Max. number of physical ports	8 ports per virtual switch
Max. number of flow entries	260,000 flow entries (About 0.5 MB of memory consumed per 1,000 flow entries)

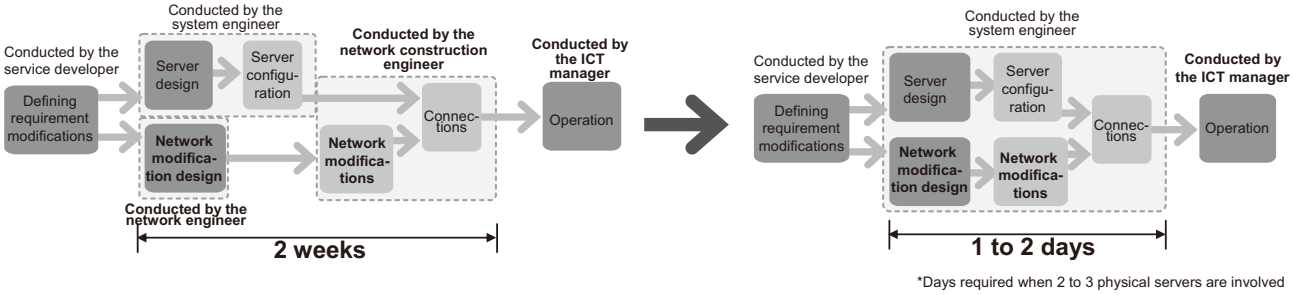

Fig. 4 Reduction of man-hours for virtual resource allocation.

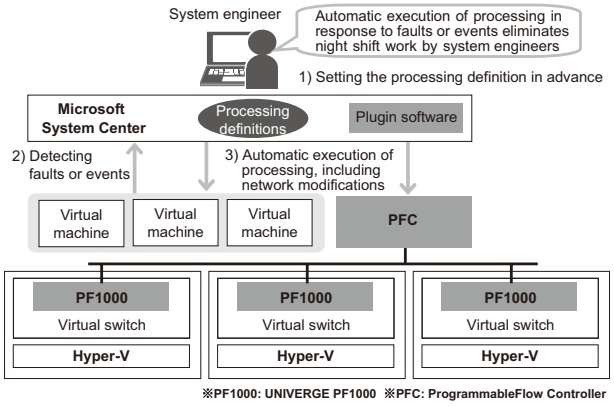

Fig. 5 Interlinking with System Center.

5. Features of the Solution

(1) Collective virtual environment configuration enabling reduction of man-hours for building and managing virtual environments

The possibilities for the allocating of virtual servers and the allocating and configuration of OpenFlow-compatible Virtual Tenant Networks (VTNs) in an integrated manner from the SCVMM means that ICT system modifications, which used to require both IT and network managers, can be accomplished by the IT manager alone. This frees the network manager from routine jobs such as network device setting changes. The period from the request of allocating a virtual server to the implementation of the actual action, which used to take about two weeks, can be reduced to about a day or two by introducing this solution (**Fig. 4**).

(2) Integrated management of virtual and physical networks for improved operation efficiency

This solution allows UNIVERGE PF6800 to perform integrated management of the Hyper-V virtual switches to which UNIVERGE PF1000 is applied as well as of UNIVERGE PF5000 series physical switches.

(3) Automation of operations linked to event information from System Center 2012 R2 and achievement of quicker fault counteraction

By interlinking with System Center 2012 R2, the time between the occurrence of an abnormality and its counteraction can be reduced through automatic execution of processing defined in advance (**Fig. 5**).

An example of a fault or event that can be dealt with using this feature is the isolation of a virtual machine from the virtual network when a virus is detected in the virtual machine or when it has stopped because common required software has not yet been installed on it.

6. Conclusion

In the above, we introduced a solution that allows the SCVMM in a Hyper-V environment to perform integrated operations management of a virtual network environment based on the UNIVERGE PF series and virtual IT devices.

As it is expected that the number of private cloud systems managed by individual enterprises will increase and that virtualization rates will also increase, much difficulty is expected in the operations management of the virtual ICT environment of a data center by several persons. The solution proposed herein solves this issue by enabling integrated operations management of the UNIVERGE PF series virtual network and virtual IT system from the SCVMM management tool.

At NEC, we believe that the need for integrated management solutions for virtual ICT environments will further increase in the future.

* OpenFlow is a trademark or registered trademark of Open Networking Foundation.

* Windows Server is a registered trademark or trademark of Microsoft Corporation in the U.S. and other countries.

Authors' Profiles

KATSUURA Keita
Expert
SDN Strategy

MIYAUCHI Mikio
Senior Expert
SDN Strategy

NUMAZAKI Takeshi
Expert
SDN Strategy

KUROGOUCHI Yuuji
Project Manager
IT Systems Division
NEC Soft, Ltd.

SATOH Yasunori
Assistant Manager
SDN Strategy

KOSEKI Takayuki
Leader
IT Systems Division
NEC Soft, Ltd.

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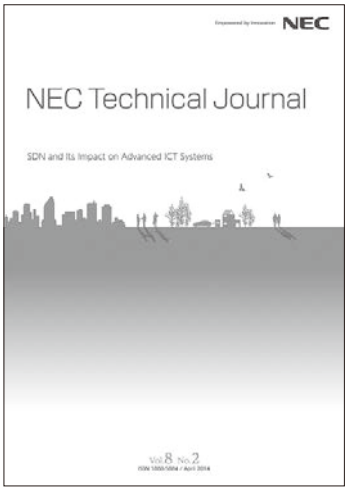

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