Provisioning of Standardized Business Systems

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In the face of severe business conditions, companies have a growing need for flexible business processes and innovative, low-cost information and communications technology (ICT) systems to conform to their management policies. For this reason, there is rising expectation for private clouds, which will provide cloud computing environments for in-house ICT systems. However, when customers are going to virtualize their systems and consolidate them into their private clouds, it becomes necessary to integrate various ICT systems that were originally optimized for individual departments into data center servers on the customer's premises. This brings together a wide assortment of software (operating systems [OS's], middleware and applications), which increases the operation-and-maintenance workload of the system manager. This paper presents techniques for converting standard patterns in ICT systems into system templates and for automatically allocating the resources required by an ICT system to a virtual environment, and describes provisioning techniques (for automating OS or middleware configuration and definition) that aim to increase the agility of automatic allocation. It also introduces Fujitsu's Systemwalker Software Configuration Manager V14g as management software for automating software deployment and parameter setting on virtual servers.

1. Introduction

Under the recent severe business conditions, companies have a growing need for flexible business processes and innovative, low-cost information and communications technology (ICT) systems to conform to their management policies. For this reason, there is rising expectation for private clouds, which will provide cloud computing environments for in-house ICT systems.

Meanwhile, when customers are going to virtualize their systems and consolidate them into their private clouds, it becomes necessary to integrate various ICT systems that were originally optimized for individual departments into data center servers on the customer's premises. This brings together a wide assortment of software (operating systems [OS's], middleware and applications), which increases the operation-and-maintenance workload of the system manager. In addition, as open, multi-vendor software is widely spread and objects to be managed are getting more diversified, managers are finding it difficult to oversee an entire ICT system. Furthermore, lack of standardization of ICT systems requires various operations for different patterns, posing a hindrance to automation of data center operation.

As a product to solve these challenges in building private cloud environments, Fujitsu has developed and put on the market Systemwalker Software Configuration Manager V14g (hereafter CF-MG). CF-MG reduces the workload of system managers by: (1) helping customers to standardize unnecessarily various patterns (combinations of hardware and software) of ICT

systems into manageable number of templates, (2) automatically allocating virtual systems based on the specified templates to meet users' needs (how many systems and what type of systems they need) on demand and (3) implementing provisioning (automating the configuration or definition of OS and middleware) that increases the agility (reduces the time required before the start of use) of automatically allocated virtual systems.

This paper describes technology of provisioning and automated allocation of virtual systems provided by CF-MG.

2. Problems in data center operation and maintenance

A private cloud is often built in three phases: virtualization, standardization and automation. Virtualization that makes use of a hypervisor[note)] pools ICT resources (servers, networks and storage), which significantly reduces the preparation time for on-demand allocation of virtual machines.

The increasing burden of operation and maintenance work at data centers has already become a problem. A similar problem has also arisen in using virtualization technologies to consolidate servers. Solving these problems is the first step to building a private cloud.

This section outlines operational problems revealed in consolidating servers into data centers and discusses the functions and techniques that provide solution to these challenges.

2.1 Standardization of ICT systems and reduction of human labor

The conventional ICT systems have been optimized for individual business servers and it means that the OS's or middleware often come in many different types and version levels. When delivering business servers, different installation processes and parameter setting methods have to be used depending on the OS or middleware. Thus, specialized staff are required and this leads to increased operation-and-maintenance workload at data centers.

For this reason, it is necessary to unify (standardize) types and version levels of OS's or middleware and to automate operations carried out by specialized staff to reduce human labor and thereby minimize human errors and reduce the operation cost.

Figure 1 shows a flow of virtualization.

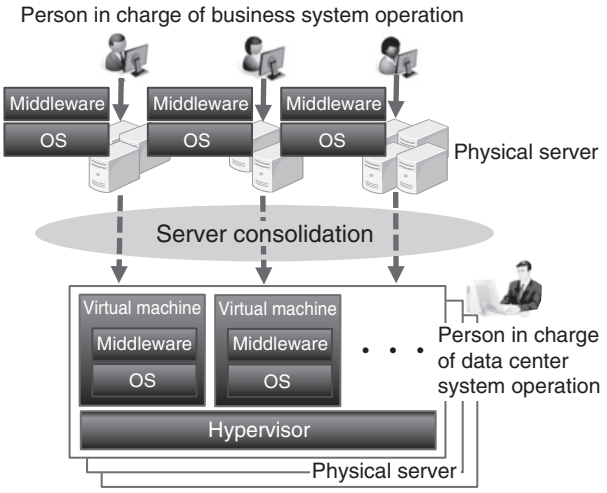

Figure 1
Server consolidation and virtualization.

2.2 Unified management and visualization of ICT system information

The number of servers to be managed is being increased by server integration and an open, multi-vendor approach is being increasingly adopted for the pieces of software to use. This has created a tendency toward greater diversity and more OS's or middleware to be managed. Traditionally, system configuration information about them (names, version levels, patch information and such like in relation to hardware and OS's, middleware and applications) has been manually managed by system operations managers using spreadsheets. This has sometimes led to a failure to update or

note) A control program for realizing a virtual machine, a technique of computer virtualization.

check the content of the spreadsheets correctly, resulting in service level deterioration. In addition, when a bug fix (patch) is offered for an OS or middleware, searching for the server to which it is applied has been time-consuming.

To improve these data center operation and maintenance tasks, standardization that reduces the types of objects to be managed is the first step. In the next phase, it is important to make use of configuration management databases (CMDBs) to centrally manage ICT system hardware and software information for visualization.

3. Deployment of virtual system in view of business operations

CF-MG is capable of registering and managing the configurations of ICT systems (servers, networks, storage and software) as system templates. To create an operational virtual system, users only need to select system templates and give deployment instructions.

A system template can be configured to connect multiple virtual servers to multiple network segments. For example, a two-tier system as shown in **Figure 2** can be configured in which Web servers are provided in the DMZ segment and application servers in the internal segment. This kind of wide configuration capacity allows deployment of a business system in view of security, not to mention a development and testing environment.

On each virtual server, multiple network interface cards (NICs) can be deployed according to the configuration of the system template, each of which can be connected to a different network segment. This means that independent NICs can be connected to the business server segment and operation management segment, respectively, as shown in **Figure 3**. Because you can define flexible network configurations, the existing business systems can easily be migrated to this virtual platform.

Even within a system template configuration, you can specify a class of physical storages to each virtual server in the template. This allows the optimum storage to be selected in accordance with the application of a virtual server.

For example, you can carve out the disks for a Web server from the pool of inexpensive non-mirrored storages and the disks for a database server from the pool of mirrored ones. This configuration could be very efficient in certain cases.

The configuration information of systems deployed according to system templates is stored in CMDBs in the form of Resource Control XML (RCXML), developed by Fujitsu, and

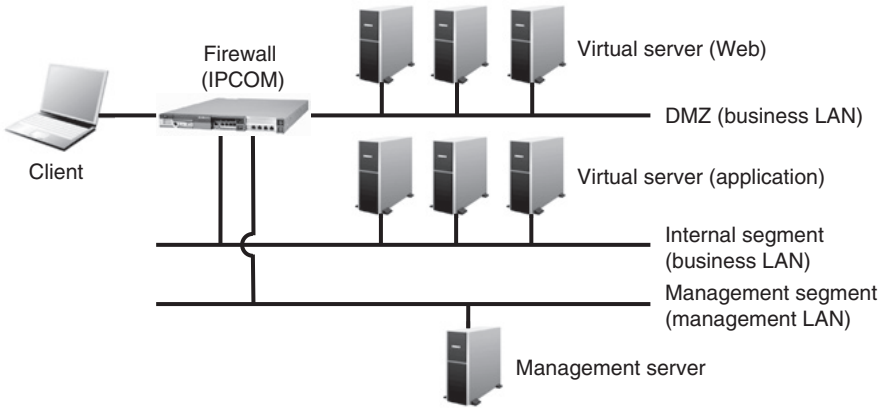

Figure 2
Virtual system of two-tier model.

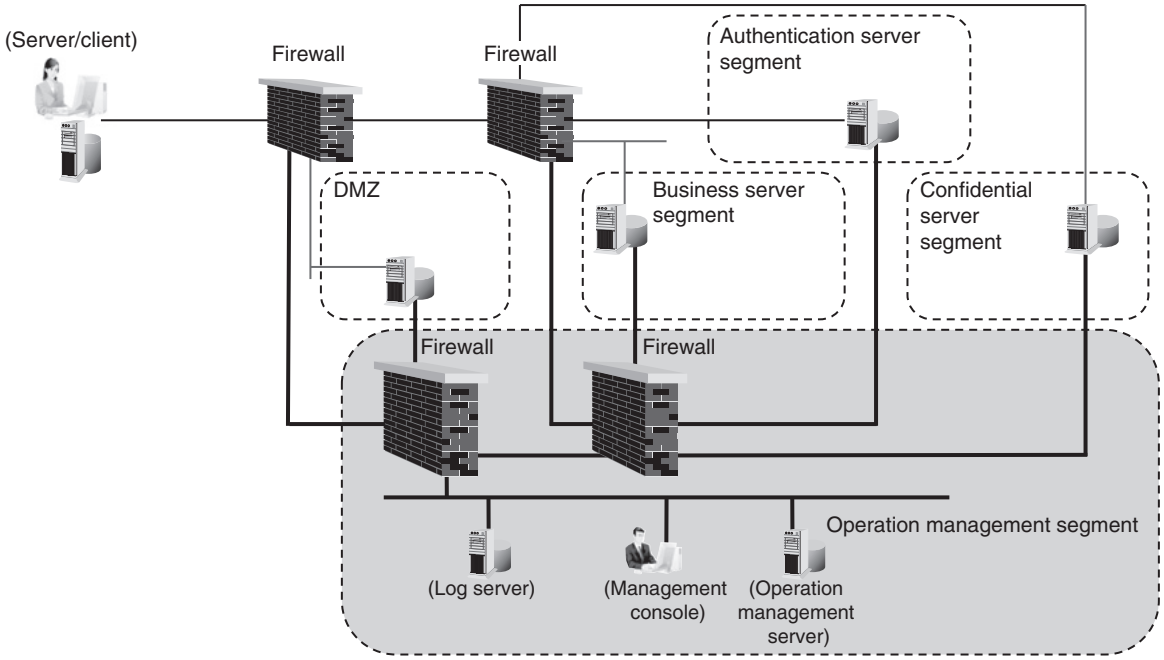

Figure 3
Example of management LAN topology.

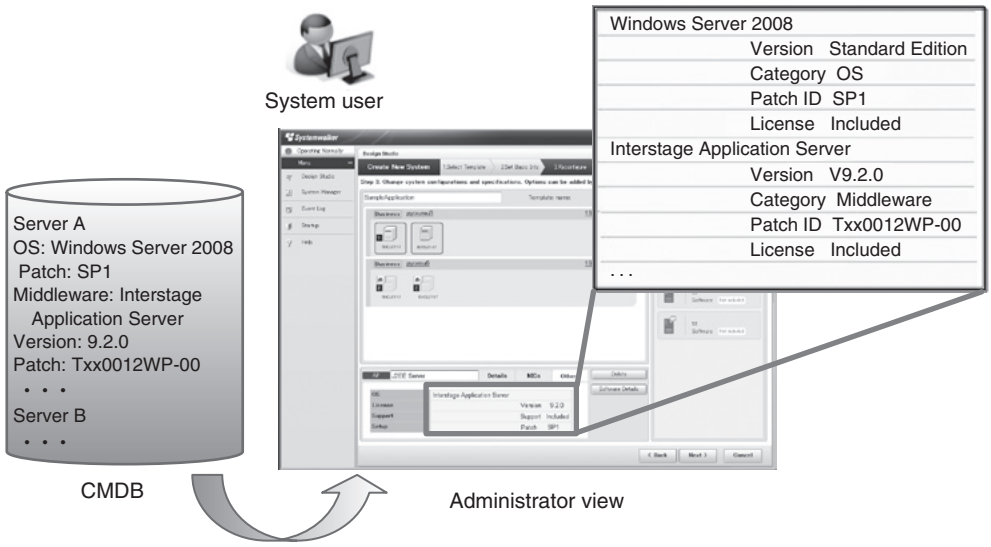

Figure 4
Unified configuration management on admin-view.

centrally managed. You can use the admin-view of CF-MG to centrally manage the network segments that constitute the system, the number and specifications of the servers provided in the individual network segments and the types, version levels and patch application status of the software installed on servers. This is shown in **Figure 4**.

4. Provisioning of OS's or middleware

With CF-MG, parameters of OS's and

software can be automatically configured when virtual servers are deployed. The concept of the parameter configuration functionality is illustrated in **Figure 5**.

Automatic configuration of parameters (including host names and IP addresses, which are dynamically assigned at the time of virtual server deployment, and parameters of middleware that need to be configured for individual virtual servers) in OS's or middleware at the time of deployment makes it possible to start business operations of a system immediately after the deployment. For OS's, configuration functionality for IP addresses, default gateways and host names (computer names) is provided. For Fujitsu's middleware, CF-MG provides configuration functionality for the set of parameters that are often required to be adjusted at the time of system construction for each server. This set of parameters was selected according to Fujitsu's know-how gained in our system construction business. Furthermore, parameters can be added for individual servers when system templates are created. Users can prepare multiple combinations of values to be used for defined parameters. Users can select one combination from them at the time of deployment according to the intended use of the server.

Definition of parameter configuration consists of several components. The first one is a parameter configuration script and the second is its parameter declaration. These two are for individual piece of software. The third one is parameter information. It is a pair of parameter name and its value to be given to one or more of the scripts at the time of deployment.

The parameter configuration scripts configure parameters by the invocation of the software configuration commands or editing of the configuration files. For Fujitsu's major middleware, parameter configuration scripts and parameter declarations are incorporated in CF-MG in advance, allowing the middleware to be used immediately. Parameter declarations are definitions of the names and types of parameters used by the parameter configuration scripts as inputs and default values of required parameters.

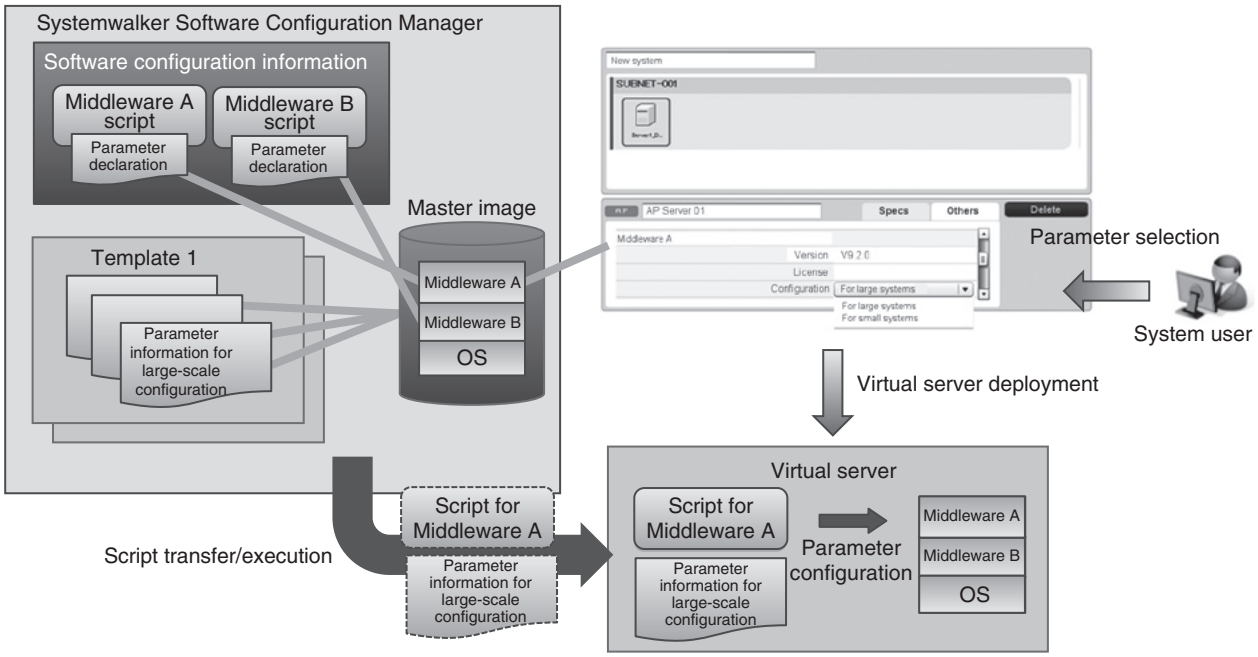

Figure 5
Overview of parameter configuration functionality.

What must be configured for the middleware to be operable, such as IP addresses, can be configured at the time of deployment without fail by defining as mandatory parameters.

Parameter information includes definitions of parameters given to parameter configuration scripts and their values. The system operations manager can give names to combinations of different parameters for registration. They are "configurations."

For example, a business system can be classified as "Small-scale configuration" or "Large-scale configuration" according to the scale of its use. Then, the system operation manager can register these "configurations" with appropriate parameter values respectively. He/she can specify any of them as an option in a system template.

Figure 6 shows an example of a software configuration definition.

Configurations defined in this way can be selected when deploying a system, as shown in **Figure 7**. This allows users to configure parameters according to the application by selecting the name of a combination of parameters such as "Large-scale configuration" even if they do not understand the meanings of the individual parameters.

Fujitsu has made provisioning possible by providing scripts in advance for about 20 products including the following middleware products:

- Interstage Application Server
- Interstage List Creator
- Systemwalker Operation Manager
- Symfoware Server

5. Activities in future

The basic functionality of CF-MG described above and Fujitsu's cloud middleware products Systemwalker Service Catalog Manager, Systemwalker Runbook Automation and ServerView Resource Orchestrator can be combined. This enables practical operation management of a business system environment as well as a development and testing environment in a private cloud.

CF-MG is intended to ensure easy and speedy system operation management. We will improve the usability and operability of the functions provided from the viewpoint of a system operations manager. Also we will enhance the functions including patch management and middleware configuration management in view of the lifecycle of a system.

1) Patch management

Implements integrated management of OS security patches and middleware bug fix patches. It will detect the virtual machine to which to apply the relevant patch and prompts the user to apply the patch.

An overview of patch management is shown

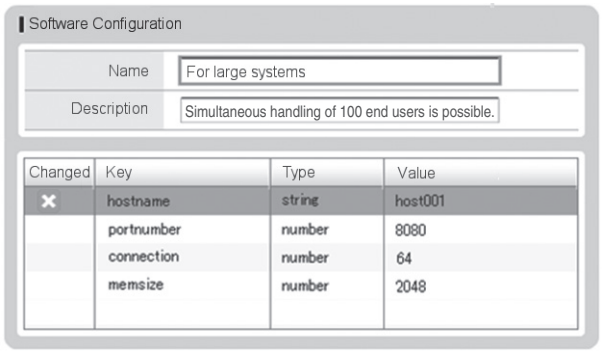

Figure 6
Example of parameter definition.

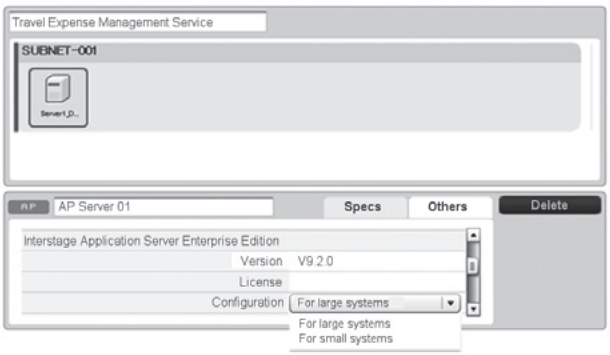

Figure 7
Selection view of parameter for software.

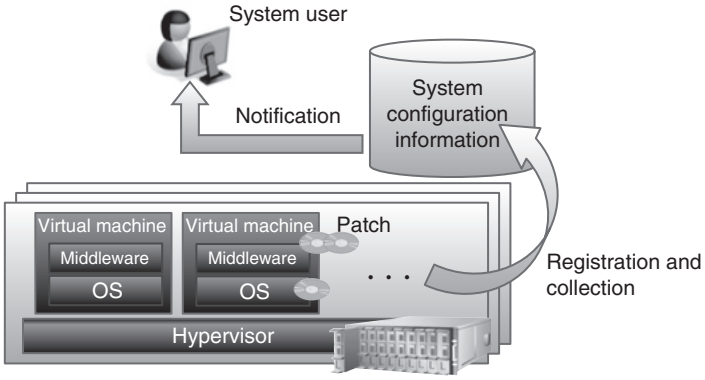

Figure 8
Overview of patch management.

in **Figure 8**.

2) Middleware configuration management

Implements configuration management of relationships between many different types of middleware that run on a virtual system.

6. Conclusion

This paper has described 1) the fundamental techniques of Systemwalker Software Configuration Manager V14g, which is virtual system operation management software for automating software deployment on virtual servers and middleware parameter configuration, and 2) the functions that can be realized by means of those techniques.

The adoption of private clouds by enterprises is likely to continue to increase in the future because it can reduce the total cost of ownership (TCO) through ensuring effective use of ICT resources and improve customer service levels by reducing the time it takes to complete services.

We intend to make use of the practical know-how in Fujitsu Global Cloud Platform operated by Fujitsu to further enhance the private cloud product Systemwalker Software Configuration Manager V14g in the future.

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