On-demand Middleware Delivery Services for Cloud Computing

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Fujitsu has been providing its Global Cloud Platform service, which enables users to build and access virtualized servers, storage units, and networks via the Internet on an as needed basis, since October 2010. This service provides server system templates consisting of virtual servers pre-installed with middleware, which dramatically reduce the workload and time for procurement, installation, and setup. In comparable services, if the user needs to install additional middleware not included in the system templates, it must be uploaded to the virtual server via the Internet and installed, which can take hours for large media packages. With Fujitsu's service, by contrast, a library hosting hundreds of software media packages, called the Software Media Pack Library, reduces the transfer time to a matter of minutes. This paper describes our efforts regarding on-demand middleware delivery services for cloud computing.

1. Introduction

Fujitsu Global Cloud Platform[1),2)] service enables users to integrate and deploy virtual networks, storage units, and servers at a data center as needed and only when needed via the Internet. A user can select a desired network configuration from a self-service portal window displayed on a Web browser, add as many servers (virtual machines) as needed to the network, and then use each server within tens of minutes.

This service also enables quick access to the middleware needed to install business applications. To use a typical middleware configuration, the user need only select a server with that middleware pre-installed. And if the user wants to add other middleware products, they can be copied from Fujitsu's Software Media Pack Library (hereinafter, "Media Pack Library") in a matter of minutes and installed.

This paper outlines Fujitsu's on-demand middleware delivery services for cloud computing (hereinafter "on-demand delivery services"), describes associated technology and the benefits of using these services, and touches upon future expansion of these services.

2. On-demand delivery services

Fujitsu developed its Global Cloud Platform under the code name "Service Oriented Platform (SOP)"[3)] with the primary design objective being to support "application-centric"[4)] development. This means easing the burden on system developers by providing in the form of services the components needed (middleware, operating system [OS], servers, storage units, network, etc.) other than the business and application logic. Fujitsu provides the following middleware delivery services and tool to support application-centric development (**Figure 1**).

1) Media Pack Library (eliminates physical distribution)

The middleware is stored in the Media Pack Library[5)] in the form of CD/DVD media data. The library provides downloading and copying

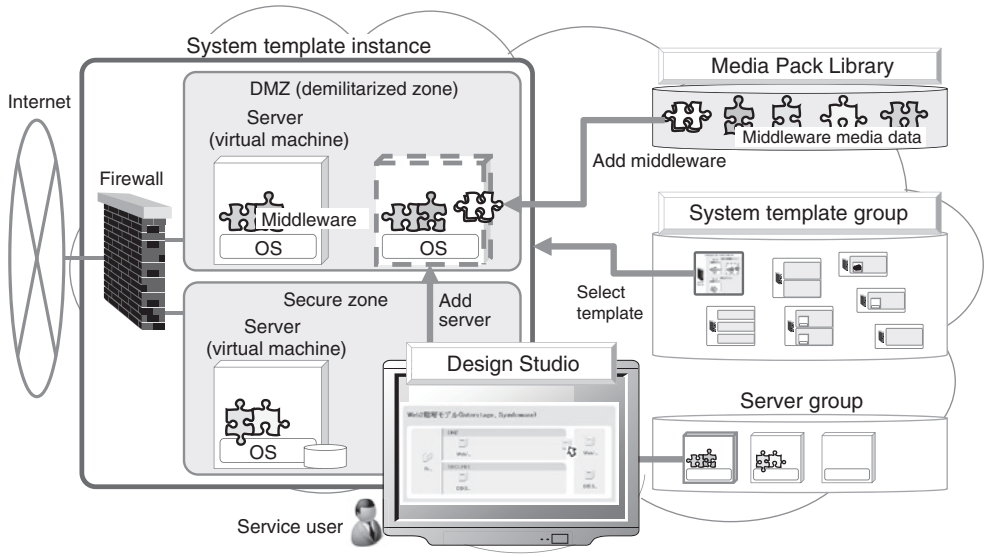

Figure 1
On-demand middleware delivery services provided for Global Cloud Platform.

functions that enable the user to copy the data to a target server deployed on the Global Cloud Platform within a matter of minutes after logging onto the server.

2) System templates (eliminate installation work)

Typical middleware system configurations, such as a two-tier Web server system, are provided in the form of operation-guaranteed templates that include a network, storage, and server configuration. By simply selecting the appropriate template, the user can deploy a new system with pre-installed middleware at the data center in tens of minutes. As a result, physical distribution of middleware is eliminated and middleware delivery time is virtually eliminated. Moreover, since neither system configuration designing nor middleware installation is necessary, the time needed to install and set up the middleware is dramatically reduced.

3) Design Studio (easy customization)

The Design Studio tool provided by the Global Cloud Platform service[2] is used for designing and modifying the configuration of a virtual system. It can be used from a Web browser to easily add a server with pre-installed middleware such as Web-application server to a system previously deployed by template selection. This operation can be easily performed by using the drag-and-drop method to add only servers that the user deems necessary.

3. Media Pack Library

The Media Pack Library was launched in Japan in October 2010 as a software download site for the Global Cloud Platform service. After purchasing a software user license separately, the user can use this site to download software programs to the user's virtual system in a short period of time.

3.1 Existing problems when installing software in the cloud

The markets for infrastructure as a service (IaaS), which enables users to use virtualized hardware resources over the Internet in an on-demand manner, and for platform as a service (PaaS), which extends the service functions provided by the hardware resources to the OS and middleware layers, are growing rapidly in Japan and abroad.[5),6)] In these markets, typical middleware configurations are prepared as

optional services.

If the middleware configuration needed by a user has not been prepared, however, the user must purchase the CD/DVD media for the middleware, insert the media into the CD/DVD drive on the user's PC, and transfer the data over the Internet to the user's virtual IaaS/PaaS system. The effective transfer speed from a PC accessing the Internet through an enterprise's local area network (LAN) when the same Internet circuit is shared by multiple organizations is generally low, so the transfer can sometimes take several hours.

3.2 Solution mechanism and its advantage

To solve these problems, Fujitsu provides the Media Pack Library as part of its Global Cloud Platform service, enabling users to download the middleware media data they need whenever they need it via a high-speed LAN in a matter of minutes (**Figure 2**).

For example, the media data for the "Interstage Application Server Enterprise Edition" middleware (about 1.3 GB) can be downloaded in about two minutes.

Moreover, since the Media Pack Library is shared among multiple organizations and is stored in compressed format in highly efficient cloud storage, it contributes to green information technology (IT). It also eliminates the need to store and manage CD/DVD media and makes it easy to quickly find particular data if it is needed later.

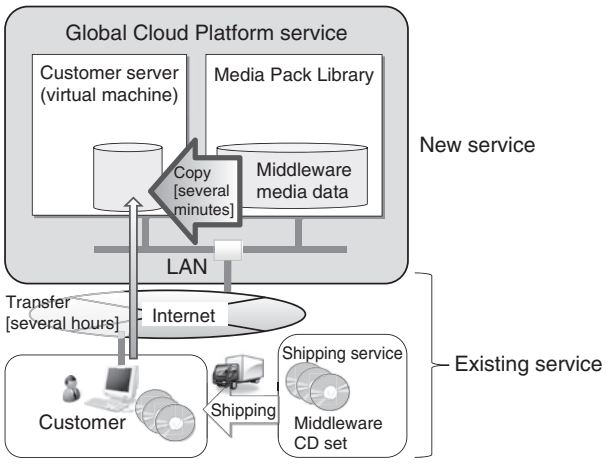

Figure 2
Advantage of Software Media Pack Library.

3.3 Middleware product lineup in the cloud

Users can download any of 51 middleware products including Interstage, Systemwalker, Symfoware, and NetCOBOL for Windows and Linux.[4] Fujitsu plans to provide other middleware products through the Media Pack Library in due course.

Even after a middleware product is no longer sold, Fujitsu will continue to provide download service and support for that product for another five years, so users can be assured of long-term middleware support.

4. System templates with pre-installed middleware

In Japan, Fujitsu Global Cloud Platform service provides network configurations with firewalls and servers in a multitude of patterns in the form of system templates (**Figure 3**). The OS and middleware for typical system configurations are pre-installed in the servers making up these system templates.

The fee for using middleware pre-installed in a template is payable on a monthly basis, and, since it is payable only for months in which the template is used, system templates are ideal for trials and small start units.

The following subsections describe the benefits of system templates and introduce a two-tier Web system template with pre-installed middleware as an example.

4.1 Benefits of system templates

1) Shortening of time to design and integrate system

Traditionally, extensive knowledge and know-how on the following processes are required

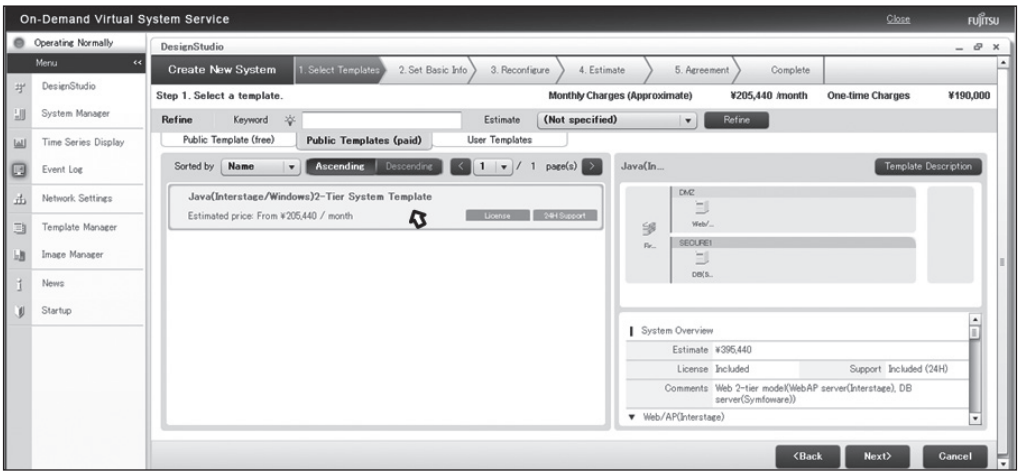

Figure 3
Interface for selecting system template.

to integrate a business system.

- Design infrastructure: network, servers, storage units, OS, middleware, etc.
- Procure, install, and set up hardware and software.

Moreover, a number of days may be needed for system testing.

The use of a system template negates the need for infrastructure design, middleware procurement, and installation. The system integrator can quickly deploy and execute applications in the infrastructure by using pre-installed and pre-tested middleware even without specialized knowledge of the hardware or software.

2) Easy deployment of secure system

Existing IaaS and PaaS systems do not support

- placement of system servers in different network zones having separate security policies or
- segregation of these network zones to prevent unrestricted communication between them.

The Global Cloud Platform service provides system templates, and each system instance is segregated by placing it in a separate network zone using virtual local area network (VLAN) technology. Servers with pre-installed middleware are placed in each zone to configure a system with multi-layered protection provided by firewalls that defend against attack.

As a result, the system deployed after system template selection has segregated zones for system security and servers with middleware in each zone. This makes it easy for the user to deploy a secure system.

4.2 Two-tier Web system template

For many years, most corporate business systems have consisted of Web application servers and database servers, and this configuration is still most commonly used.

The Global Cloud Platform service provides as a template a system with two middleware packages pre-installed (**Figure 4**).

- Interstage Application Server: Web-application server middleware providing an up-to-date high-reliability Java execution environment
- Symfoware Server: Database middleware providing high-performance and stable operations

These two packages are available for both Windows and Linux.

This two-tier system template provides

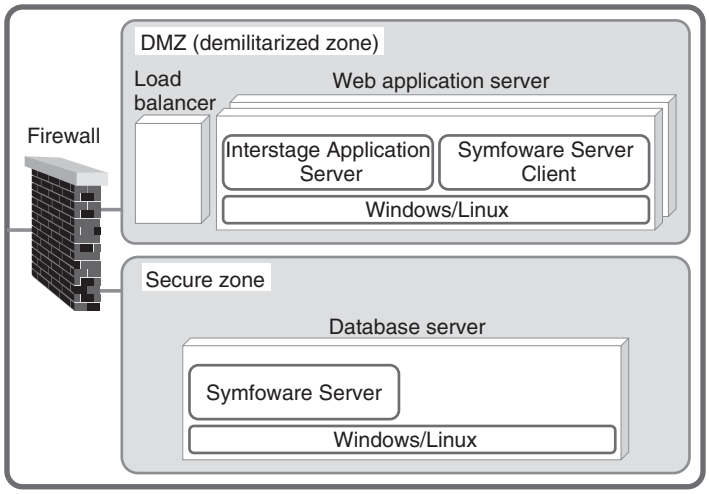

Figure 4
Two-tier Web system template (example).

several benefits.

1) Shortens system integration time

A system integrator using a system template without middleware would need several days to download, install, and set up the middleware for the Web application and database servers. This work can be completed in tens of minutes by using a two-tier Web system template. The system integrator can then concentrate on application-logic work such as loading the application-specific settings, including the database tables, and deploying, testing, and executing the applications. The system integrator then only has to set several parameters for the system firewall in accordance with the online guideline to get a secure and stable business system up and running.

2) Facilitates deployment of secure system

In this system, deployed after template selection, a database server on which confidential business information and/or personal information is to be stored is placed in a secure zone. In addition, a Web-application server is placed in a demilitarized zone (DMZ), which is a segregated zone between the Internet and an internal secure zone to be directly accessed from the Internet.

This scheme makes it easy for the system integrator to deploy a system with a secure configuration since the database server, which is in a secure zone, can be accessed only via a Web-application server in the DMZ.

3) Reinforces information security governance

Up to now, identifying users who have accessed a database in a two-tier Web system has not been possible by simply reviewing the access log. Now, in cooperation with the Interstage Application Server, the Symfoware server in the two-tier system template can output a database-access log that includes Web server user identifiers.[7] By using the Web-server logs and the database-server logs, security personnel can track down a Web-server user who has performed abnormal or unauthorized database operations. In short, this two-tier system template simplifies the construction of a system with reinforced security governance throughout.

5. Customization of middleware configuration

The middleware configuration of a virtual system deployed by selecting a system template can be customized as follows either at system creation time or during system halt.

1) Addition of a server with pre-installed

middleware

A Fujitsu Global Cloud Platform user can easily add a server with pre-installed middleware to a virtual system by using the Design Studio tool from a Web browser. For example, a Web-application server can be added to a two-tier Web system by simply dragging the icon for the desired server and dropping it into the DMZ (**Figure 5**).

2) Addition of middleware to the server

The user can add middleware such as for operations management to the server by downloading it from the Media Pack Library.

3) Reuse of customized server

The image of a virtual server to which a business application has been added can be saved for later use.

6. Future expansion

Fujitsu intends to expand the number of middleware and system templates provided for Global Cloud Platform users in accordance with customer usage patterns.

For example, Fujitsu is planning to use the Systemwalker series, which is system operation and management middleware, to enhance a service for centrally monitoring the OS and the software on a server created by a Global Cloud Platform user. With this service, a monitoring function using a management agent can be automatically put into operation when creating a virtual system by simply specifying the servers on which the user will monitor the faults and performance. Another planned template is one for a management server system in which various manager software products of the Systemwalker series are pre-installed. This system would be automatically deployed, operated for the user, and connected to the management agent. As a result, a user could centrally monitor the usage status of resources like the virtual CPU, memory, and disks of each server and could check for anomalies in the software and the OS without having to expend effort on constructing a management server system, as was previously required.

All the on-demand delivery services introduced above are for users of Fujitsu Global Cloud Platform service. However, with an eye toward the needs of global customers, Fujitsu is engaged in development of services for hybrid clouds that can be connected to industry standard IaaS/PaaS platforms and private clouds.

7. Conclusion

Although it has been only a few years since the beginning of the cloud era, the use of IaaS/PaaS has already begun to expand rapidly. Application centricity, which may be the primary objective of IaaS/PaaS, is becoming increasingly important, even for services that deliver middleware products.

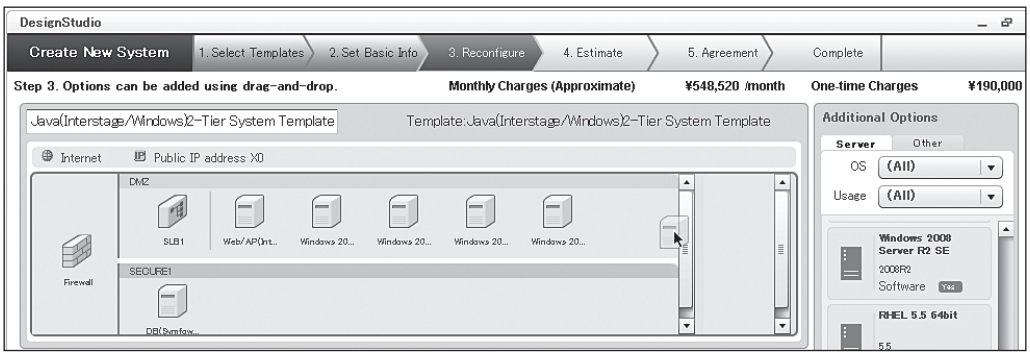

Figure 5
Server addition using Design Studio.

This paper describes Fujitsu's on-demand middleware delivery services for cloud computing, the technology enabling these services, the benefits and effects derived from using them, and future expansion.

These services enable business enterprise users to, in accordance with business strategies, dynamically operate, extend, downsize, and suspend a business application system implemented in the cloud using virtual hardware, OS, and middleware that were integrated beforehand. With these services, users can achieve faster and more flexible business development.

Fujitsu plans to provide additional services that make using IT even more agile and efficient by extending and improving our middleware and our delivery services on a global basis in line with customer expectations for cloud services.

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