

Operation Efficiency Improvements for IT Infrastructure through Runbook Automation Technology

● Hiroaki Ito

Enterprises have been consolidating their servers within on-premises data centers to optimize their entire information technology (IT) infrastructure, and they are now working to create private clouds through virtualization. The operation of an on-premises data center follows a “runbook” that describes the procedures to be taken in a step-by-step manner for either daily operations or emergency situations. Since the consolidation of servers and conversion to a cloud environment increases the volume and load of data center operations, there is a need to reduce the operation load and improve operation quality by automating these operations, which have until now been performed manually according to the runbook. Runbook automation (RBA) technology has been attracting attention as a means of standardizing and automating the workflow of manual IT-infrastructure operations and dramatically improving operation efficiency. This paper introduces Fujitsu’s approach to making IT infrastructure operations in a data center more efficient through the use of RBA technology.

1. Introduction

Enterprises have been consolidating their servers within on-premises data centers to optimize their entire information technology (IT) infrastructure (TCO reduction, efficient use of IT resources etc.) in an era of rapid change. They are now working to create private clouds through virtualization.

Basically, the operation of an on-premises data center follows a “runbook.” This describes the procedures to be taken in a step-by-step manner for either daily operations such as start-up, shut down and monitoring of systems and networks or emergency situations including system-wide troubles.

With the consolidation of servers, system operations conducted previously in each business department will be transferred to a consolidated data center (**Figure 1**). Consolidating system operations previously conducted by individual

departments will increase the volume and load of the data center operations and increase the workload of the workers involved. In addition, new types of tasks are being generated with the adoption of cloud technologies, such as lending and returning of virtual resources.

In such circumstances, Fujitsu is working to improve the operation efficiency of data centers by standardizing and automating IT infrastructure operation.

Of these efforts, we will introduce our approaches to reducing the operation load and improving operation quality by automating these operations, which have been performed manually according to the runbook.

2. Challenges in operation efficiency improvement

Based on a survey by LS Research Committee (FUJITSU Family Association), it

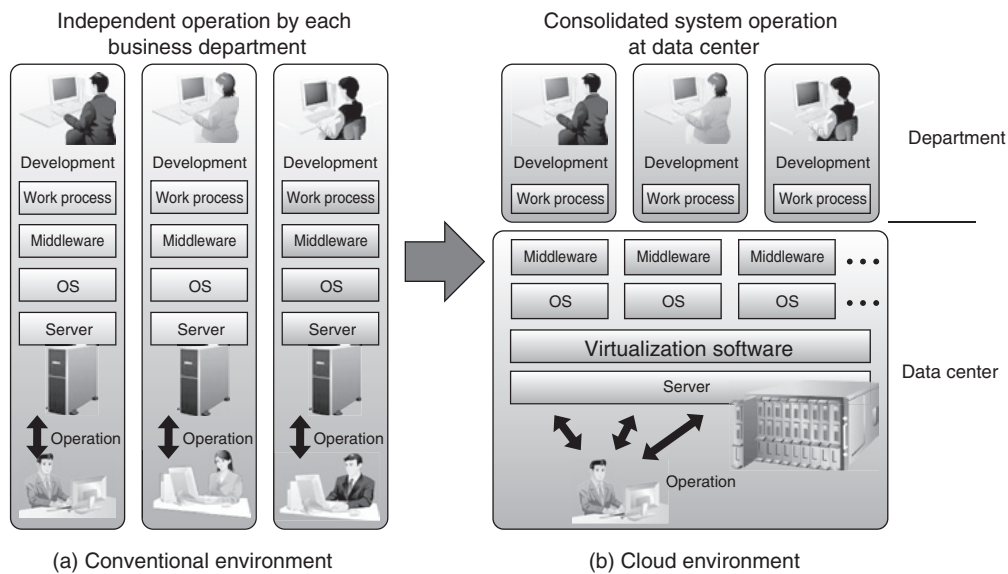


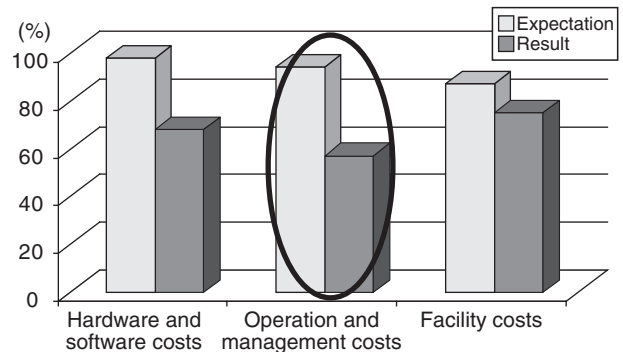
Figure 1
Change in system operation environment.

appears that costs (procurement costs) related to hardware and software as well as costs related to the space and facilities needed have been reduced through server consolidation into an on-premises data center and virtualization technology. However, costs related to operation management have not been reduced so far.¹⁾

Figure 2 indicates the percentage of customers who expect to reduce the costs of each important item through virtualization technology and also the percentage of customers who consider that costs were reduced for each item by introducing virtualization technology. Each bar shows each cost item.

Because procedures and management tools differ depending on the system, operators need to give consideration to these differences to perform operation management. Since many manual tasks are involved, consolidating servers does not result in lower operation management costs. By reducing these manual tasks, operation management costs can be reduced.

As a mechanism to automate system operation processes, scripts have previously been used. Each script is an automated series



Source: LS Research Committee IT White Paper (2009)

Figure 2
Percentage of customers who introduced virtualization technologies aiming to reduce costs; and of those, percentage of customers for whom it proved effective.

of command operations that minimize human labor. Nevertheless, there are some tasks that cannot be replaced by a simple script for automated execution. Examples include operations involving multiple servers and tasks requiring different operations depending on the OS and middleware versions or those requiring manual operations (judgment of target to operate, confirmation of result etc.). Therefore, people still need many manual tasks based on runbooks.

3. Industry trends for operation efficiency improvement

Runbook automation (RBA) technology has been attracting attention as a means of standardizing and automating the workflow of manual IT-infrastructure operations and that will dramatically improve operation efficiency. As described above, there are now urgent needs to design and construct automated workflows that support IT infrastructure operation and control, and report the results of execution. While Fujitsu has addressed clients' needs by using existing automation technologies and products such as a conventional job scheduler and creating customized scripts so far, these technologies are not sufficient to cope with these needs any more.

With regard to this challenge, RBA technology delivers the following advantages:

- RBA technology can automate tasks that are currently conducted manually for some reasons despite their simple nature. This will result in a lower operation load.
- Minimization of human errors
- Improvement of service level and compliance
- Reduction of operation costs

These advantages are expected to bring many benefits.

The products for automating operation based on RBA technology are being supplied by several vendors, who ship them as finished products. In these products, the ultimate target is to improve operators' efficiency. To achieve this target, the following features are offered to automate tasks such as provisioning or addressing incidents and problems in the integrated IT systems using virtualization technology:

1) Workflow development environment

RBA offers a development environment to define workflows on a GUI basis using a drag & drop function. The workflow can have input and output parameters. Further, description of recovery action at error as well as descriptions of conditional (if) and loop (foreach, while)

are available. In addition, it has a debug feature to support workflow development and a version control feature to store and manage the developed workflow.

2) Flow execution function

In executing workflows, multiple options are available such as execution via manual selection from GUI, start-up by designating a date and start-up based on event. Start-up from external operation via command and API is also possible. Therefore, the RBA can compensate for any difference in platforms by preparing a setting in advance, for instance, to change behavior depending on whether an identical workflow is run on Windows or on Linux. Further, because the RBA integrates a configuration management database (CMDB) feature, clients can achieve automation whenever the environment changes.

3) Documentation, reporting

The RBA outputs documents for operation processes described in workflows and also reports to indicate the results of workflow execution. These results of workflow execution can be used as evidence in audits, and you can analyze them in order to optimize the workflow.

4) Template

The RBA offers workflows that describe procedures for operation processes for various applications and environments, and also offers operation components useful in those workflows. These operation components include: i) Scripts that encapsulate basic OS commands and operation of tools integrating basic operation control protocols, ii) Adapters to establish linkages with operation management products.

4. Fujitsu's approaches to improve operation efficiency

The operation efficiency of data centers can be improved by introducing a product to automate operations using RBA technology.

It becomes easier to describe operation procedures as a workflow by hiding the detailed and complex portions in the operation

components. These components are designed to be called from the workflow, and encapsulate the related complexities such as types of commands and their associated parameters.

As the next stage for automating operation procedures, an attempt is made to use a workflow mixing manual decision making (application and approval, selection, confirmation, etc.) and automated execution. Fujitsu's Systemwalker Runbook Automation V14g (hereafter "Systemwalker RBA") is a product based on RBA technology. It can create workflows including human decision making.

This function is carried out by a mechanism whereby in a workflow a request is sent to a specific operator. Then, he/she carries out operations via a screen. The workflow can execute operations carried out by IT systems and manual processing such as confirmation and judgment in itself. With this configuration, it is possible to create a workflow for an entire operation procedure encompassing multiple tools and multiple functions and organizations. In this way, RBA can standardize and automate workflows that were prescribed in runbooks in the conventional systems. Because the amount of manual operations is reduced to the minimal tasks required, such as confirmation and

judgment of automated operations, operation efficiency is improved (**Figure 3**).

The main characteristics of Systemwalker RBA are mentioned below:

- 1) Mitigation of work load of data center operators

With this product, you can combine both the automated operations for OS/middleware and human judgment and confirmation into one workflow. This removes unnecessary variations of operations and results in high efficiency. The set of operations carried out manually so far based on runbooks can be converted into one workflow, and total efficiency of data center operations will rise.

Different types of OS and middleware can be operated in an identical manner by using a workflow. Standardizing operational tasks allows workers who do not have operational skills to run the system, thereby leveling the workload.

- 2) Improvement of operation quality by workflow-based operations

By introducing a workflow for operation procedures to address troubles and system changes, it is possible to calmly and stably carry out the operations needed. Minimizing omissions or erroneous operations will result in improved operation quality.

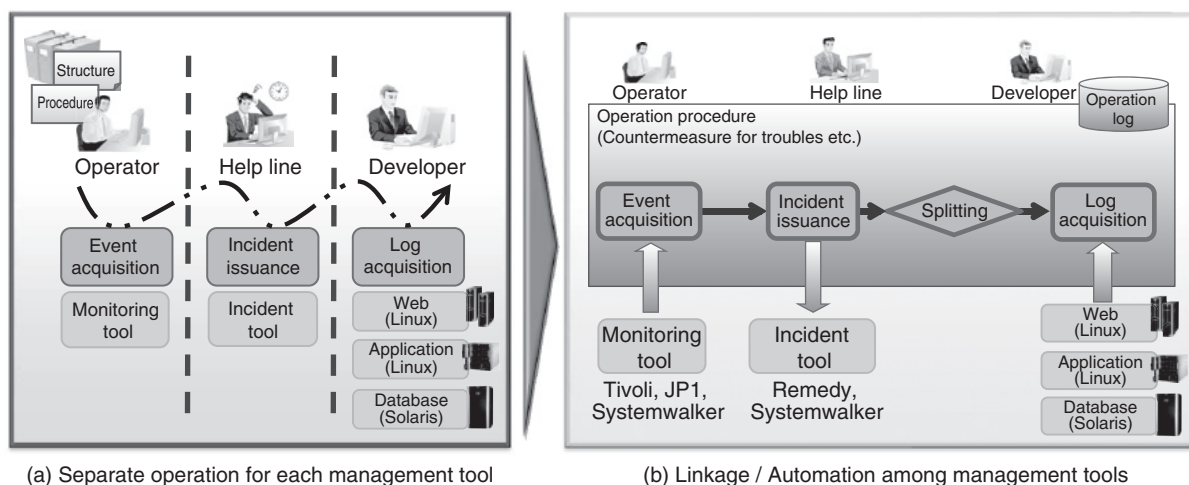


Figure 3
Effect of Systemwalker RBA introduction.

Conventionally managers in data centers have monitored the operations themselves, work hours of operators and outcomes in the data center by reading the reports written by the operators. However, these specific items can be monitored with a log of executed workflows. This then allows operation processes to be quickly and reliably reviewed.

3) Creation of efficient workflow

RBA offers operation know-how as a form of template. Customers can make their own workflow easily by customizing the templates.

By offering a GUI-based development environment for creating these workflows (**Figure 4**), users can generate their own workflow by combining operation components.

5. Conclusion

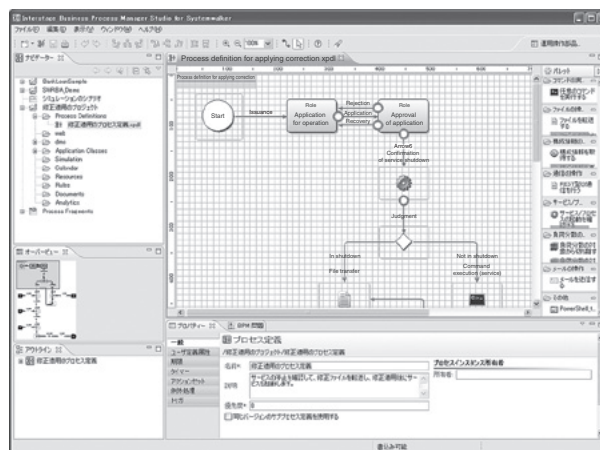
We started shipping the Systemwalker RBA product described in this paper in June 2010.

Going forward, we will improve operation processes based on active use of statistical data from workflow output, make it possible to have dynamic changes of workflows depending on the operation status, and enhance the advantage that allows workflow to include manual work.



Hiroaki Ito
Fujiitsu Ltd.

Mr. Ito is currently engaged in developing operation management middleware.



(Original is in Japanese)

Figure 4
Development environment GUI of Systemwalker RBA.

We will continue making the utmost efforts to further improve operation efficiency in on-premises data centers.

Reference

- 1) Fujitsu: Survey Results on Automation (FY2009)
“LS Research Committee IT White Paper.” (in Japanese).
<http://jp.fujitsu.com/family/lksen/activity/survey/09/index.html>