

# Industrialized IT “TRIOLE” toward Datacenter Optimization

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**An increasing number of activities in our society have become dependent in recent years on Information Technology (IT), which currently functions as the foundation of government, enterprise business, and many aspects of our daily lives. Given the deepening relation between IT and society, however, new social problems related to IT have emerged. The industrial world has been solving various problems by standardizing products based on new technologies on a continuous basis through industrialization. Fujitsu has challenged the industrialization of IT based on three core technologies: Virtualization, Automation, and Integration. This paper introduces some of Fujitsu’s activities geared toward providing optimum systems by industrializing processes related to IT, which is the basis of TRIOLE. It also describes the basic technologies and concepts of TRIOLE.**

## 1. Introduction

The deepening relation between Information Technology (IT) and society has resulted in the emergence of new social problems related to IT. One such problem is information security. Most companies now store personal information in the form of a customer database. While such data serves as a powerful tool for sales and marketing, there is a risk of data being leaked and illegally manipulated. Since personal data is frequently leaked, people feel insecure and uncomfortable about how their personal data is being used or stored. Another problem concerns the global environment, especially in terms of electric power consumption. For example, IT devices now account for 5% of Japan’s total electric power consumption and we are concerned that such consumption will increase sixfold by 2025, and then become 12 times higher by 2050 based on IT levels in 2006. Therefore, the IT industry must assume responsibility for “green” IT.

The industrial world has generally met

public needs and tried to solve problems by standardizing products at a moderate price based on new technologies on a continuous basis through industrialization. For instance, the textile, metal, and automotive industries have introduced the concept of industrialization whereby production lines are designed to reduce burden, ensure smooth production, and eliminate waste. Unlike these industries, the IT industry finds promoting industrialization too complicated because it must sometimes deal with wide-ranging and often ambiguous systems and services. In view of this handicap, Fujitsu has challenged the industrialization of IT.

## 2. History of TRIOLE

Announced globally in 2002, TRIOLE is Fujitsu’s concept for defining the directivity of future IT systems for customers. The three core technologies of TRIOLE are Virtualization, Automation, and Integration. The history of strengthening Fujitsu’s platform according to the

concept of TRIOLE is described below.

- 2002

Released the IPCOM network server for realizing the virtualization and automation of networks.

- 2003

Released the PRIMERGY blade server for realizing virtualization by using a standard high-volume server. Began using TRIOLE templates for the effective and safe integration of IT Infrastructure.

- 2004

Fujitsu defined and introduced TRIOLE as its strategy for IT optimization in response to such customer challenges as business efficiency, agility, and continuity worldwide. Released Systemwalker Resource Coordinator middleware to expand automation and virtualization applications for IT Infrastructure.

- 2005

Released the PRIMEQUEST high-end server to achieve automation that exceeds that of mainframes. Strengthened automation and virtualization of the PRIMERGY blade server through SAN boot support.

- 2006

Fujitsu introduced an industrial process in TRIOLE to achieve greater efficiency, security, and safety by focusing on the life cycle of IT systems.

- 2007

Released the SPARC Enterprise high-end Unix server to achieve automation and virtualization. Strengthened the virtualization of PRIMEQUEST to enable the operation of mainframe resources. Combined the PRIMERGY blade server and Systemwalker Resource Coordinator to strengthen virtualization. Also systematized IT operations and maintenance service.

### 3. Fujitsu’s challenge: Industrialization of IT systems

Fujitsu decided to launch TRIOLE because

we strongly recognized the growing complexity of hardware and software that comprise IT systems. In order to focus on scenes of user applications, Fujitsu collected and analyzed approximately 9000 proposed models over the past four years, and then extracted 26 typical application scenes. According to the development stage of each scene, we built the model of an optimal platform that comprehensively integrates all elements such as the server, storage, network and middleware. In this way, we successfully established a theory that allows us to immediately understand the current conditions and targets set by customers from various standpoints that include cost, reliability, performance, operation, and controllability. **Figure 1** shows the optimization model of the IT infrastructure obtained from this investigation, as well as part of an industrialization process. Based on this theory, we are able to build an advanced system in a short period of time and lead the customer in the right direction.

Nowadays, customers expect us to clarify the immediate activities toward achieving an IT system and steps to be taken in the future based on life cycle. We are confident in being able to present an overall picture of the IT infrastructure as an “application scene” in an easily understood and user-friendly manner. All elements such as the server, storage, network security, and operation are always comprehensively integrated.

### 4. Trends in IT systems

IT systems originated from the centralized type of mainframe, followed by rapid decentralization with the advent of open systems in the 1990s. From about 2000, however, IT systems have been operated by integrated datacenters in view of the greater social responsibility placed on such systems. **Figure 2** shows the transition in IT systems. Moreover, conventional mission-critical systems mainly process and save data in an integrated manner. Such an arrangement must include a vital system for connecting to other corporations and public institutions due

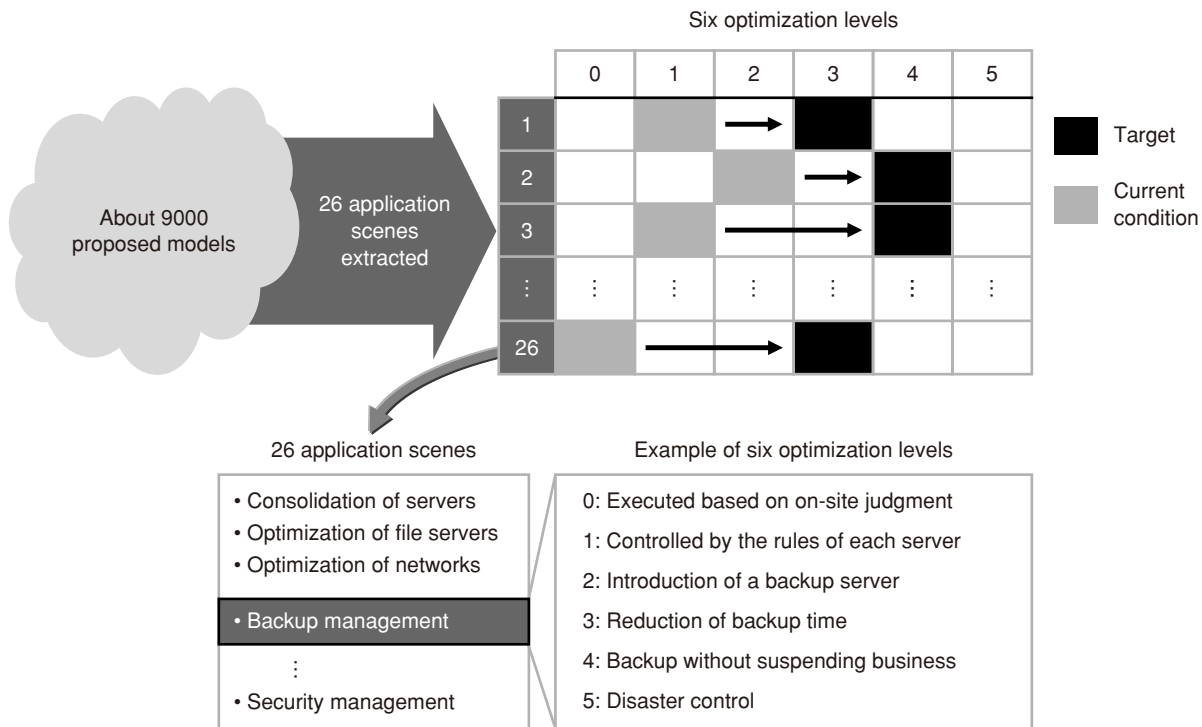


Figure 1 Optimization model of IT infrastructure.

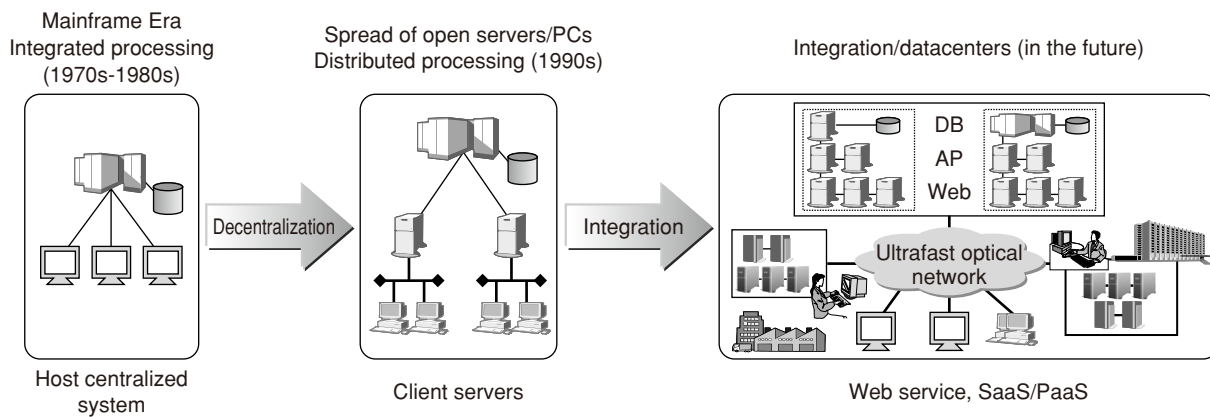


Figure 2 Transition in IT systems.

to the development of networking. Based on past trends and our investigative results, we visualize our future IT systems as follows:

The needs of datacenters and the importance of related supporting IT infrastructure are expected to increase, given the spread of Software as a Service (SaaS) and Platform as a Service (PaaS) that exclusively entail services. People will expect servers to provide even higher reliability, and increasingly adopt multi-core CPU and virtualization technology. The market for mission-critical open servers will certainly grow until the year 2010 (at a Compound Annual Growth Rate [CAGR] of 7%).

As part of IT industrialization, we have considered what true platform should be prepared to accommodate the era of SaaS and PaaS. Our first priority is to offer IT systems that can help customers navigate in the right direction.

## 5. Virtualization technology

Virtualization is a core technology for realizing the optimization of IT infrastructure. Fujitsu focuses on applications geared towards shared hosting services that will increase in the future.

There are two major objectives of virtualization.

One is to make life cycle independent of the business application layer and IT infrastructure layer. The average life cycle of such open infra-components as servers constituting a datacenter is currently as short as three to five years. Replacement with the latest infra-components will affect the business application layer, and some application conversions and tests for the adaptation of a new infrastructure will impose a heavy burden on users. TRIOLE makes life cycle independent between the two layers through virtualization, in order to minimize the cost burden.

The other objective is to provide a mechanism of taking out and returning necessary executable infrastructure resources as required

through virtualization, and pooling the executable infrastructure of network, storage, and server equipment. This is the original concept of TRIOLE. Through extensive research and development, we have established the elemental technologies necessary to achieve both objectives and are integrating those technologies into our individual products. We will design and construct the next generation of shared hosting services, and verify it in the services of the entire datacenter system.

**Figure 3** shows the virtualization technology for optimizing a datacenter.

## 6. System management technology

Although we concentrate servers and storage in a datacenter, and promote physical consolidation in order to reduce Total Cost of Ownership (TCO), such measures prove ineffective if installation and operation entail too much trouble. It is more important than ever to execute various business applications by using a large number of devices in a very effective manner. At the same time, we should comply with various rules required for social and corporate activities. For these reasons, datacenter operations should primarily unify the management of various components that constitute a system (e.g., server, storage, network), and secondarily clarify and visualize the operation status.

TRIOLE achieves both goals by supporting system installation, operation, and maintenance through middleware and services compliant with the IT Infrastructure Library (ITIL). **Figure 4** shows the operation for optimizing datacenters.

Fujitsu has also constructed an IT infrastructure factory. The factory is collectively building up an IT infrastructure typically built at a customer's site, in order to improve both productivity and quality. The use of TRIOLE templates facilitates closer coordination between System Engineers (SEs) and the factory, resulting in operations and maintenance of improved

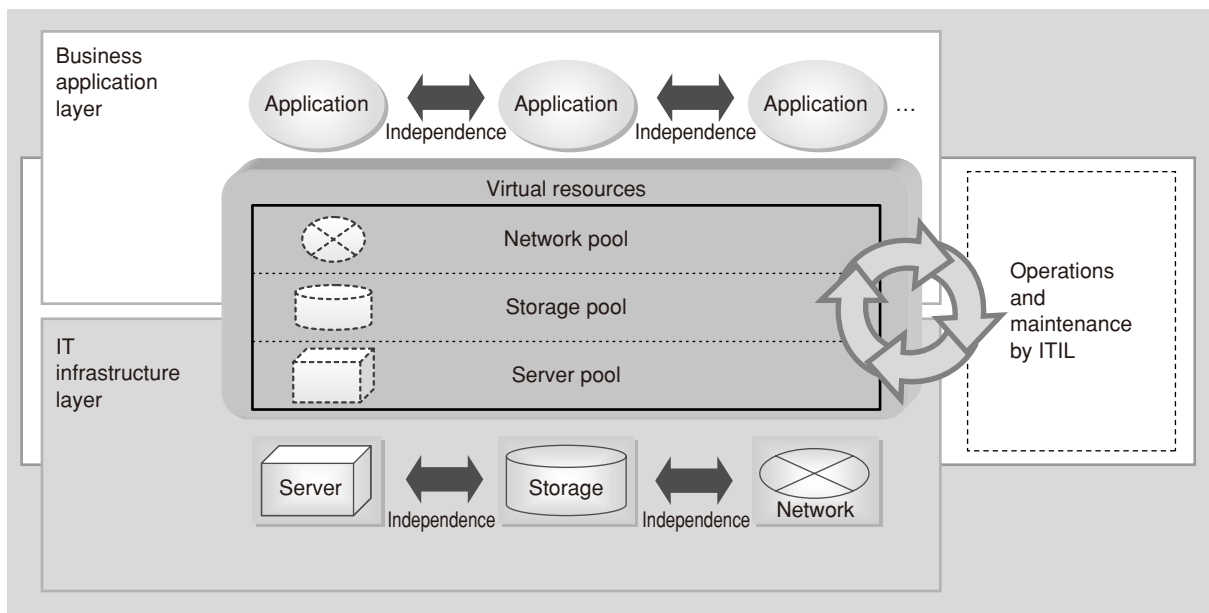


Figure 3  
Virtualization technology for optimizing datacenter.

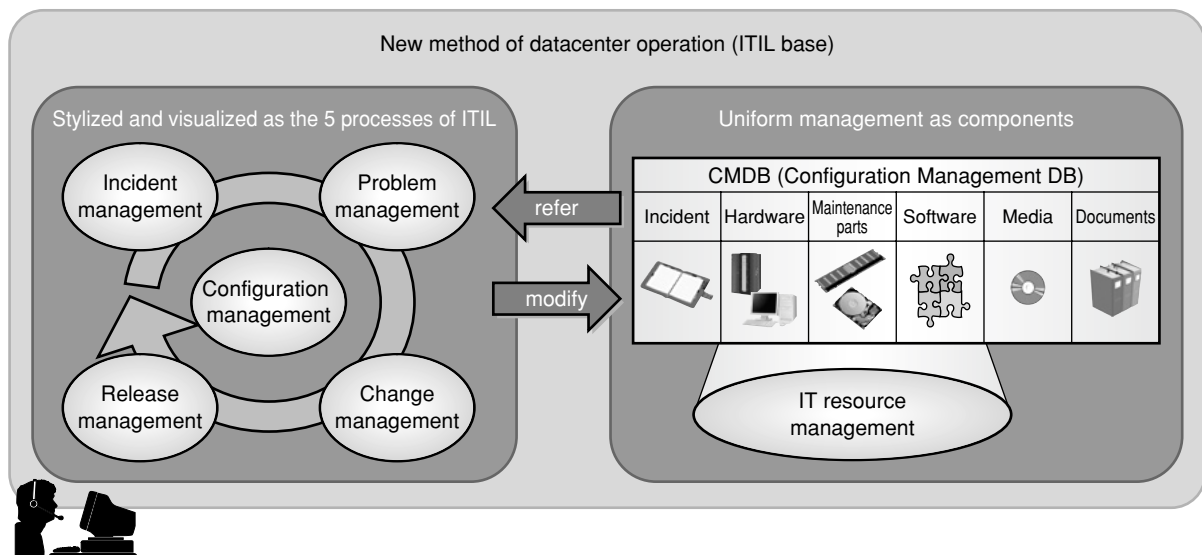


Figure 4  
Operation for optimizing datacenters.

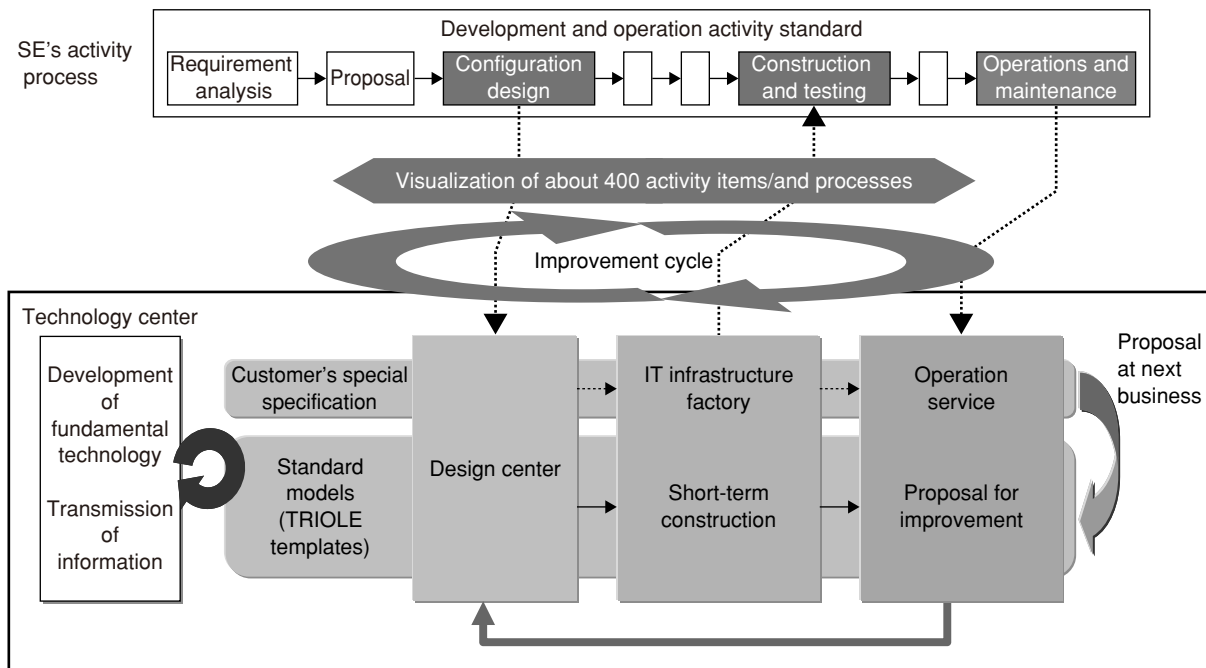


Figure 5  
Main activity processes at IT infrastructure factory.

efficiency and quality. **Figure 5** shows the main activity processes at the IT infrastructure factory.

## 7. Conclusion

This paper has described emerging world-wide problems related to IT that are becoming

more serious. The IT industry is faced with the responsibility of solving such problems. Based on the concept of TRIOLE, Fujitsu is making great efforts to solve these problems by optimizing IT with the help of new technologies.



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