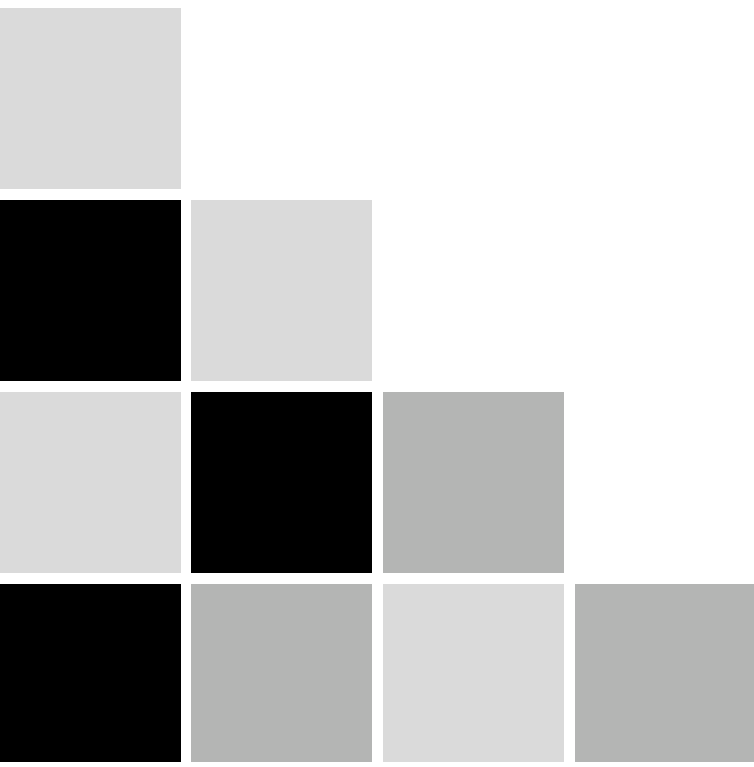


**TRIOLE**

# Executive White Paper

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Edition 1 May 2004



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# Background

The IT industry has entered the next phase of the open era. The building of IT infrastructures using a combination of “open systems” and “best-of-breed” products has changed.

After the mainframe era, the open era brought the revolution of free choice, with many innovative technologies appearing, particularly after the popularizing of the internet.

As companies seeking new business opportunities adopted such technologies, the IT environment further fragmented and diversified, creating unsustainable levels of complexity. Now Web services, Grid computing and open source as typified by Linux have made an appearance. The additional complexity of those technologies and concepts is yet another threat to IT infrastructure costs.

Added to this complexity, new customer requirements, new competitors, and new technologies now create the triggers for constant business process change, while the need to reduce overheads remains. CxOs continue to search for breakthroughs in strategy that allow them to more quickly adopt IT technology as a means to change without increasing budgets. Their requirements are no longer just concerned with support for efficiency of process but to deliver the best possible capability at the lowest possible cost. Now to be truly innovative, organizations need their IT environment to be fully aligned, integrated and capable of quickly and reliably supporting business requirements. Any future IT infrastructure must achieve all of the following:

- Business Efficiency
- Business Agility
- Business Continuity

as well as having the cost model more aligned to that of utility.

Fujitsu is a globally committed long time provider of mainframe and open systems. With thousands of customers (including over half the Fortune Global 500 and many global “brand name” companies) it is seeking solutions to the ever-growing complexity, cost of ownership and ubiquitous deployment of IT infrastructure. This paper summarizes a strategy for optimized IT, known as TRIOLE. This details Fujitsu’s thinking and next phase in open era delivery plans for the provision of IT infrastructure that maximize IT utilization, protects investment and resolves the issues of increasing complexity. Intended to enable organizations to better ride the waves of technological change it shows a practical roadmap for the introduction of utility computing, by evolution rather than revolution.

## TRIOLE Summary

TRIOLE from Fujitsu delivers ways to improve technology deployment, reduce cost of ownership, remove complexity and reduce the management overhead from IT infrastructure. It also provides a practical way to move to a utility model of IT deployment.

TRIOLE enables a practical and realistic way forward that could revolutionize all this. TRIOLE removes development and implementation costs while centralizing expertise. This in turn helps ensure “world’s-best-practice” in application deployment.

TRIOLE achieves optimized IT infrastructure by combining the product technologies of Virtualization, Automation and Integration.

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# Chapter 1

## The challenge of change on business and IT

## Chapter 1 The challenge of change on business and IT

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In the next phase of the open era, the challenge is to move from unsustainable growth in complexity to a simpler model of integrated utilities. Only then can function be more easily managed.

Each function needs to become a utility in its own right, enabling different customers to reuse the same expertise in their own IT infrastructures. Then by grouping appropriate utilities together, the business needs of the organization can be met at much lower cost.

From now on IT infrastructure will be scrutinized from every aspect including the most effective use of existing IT assets, the time to develop and deploy new IT systems, and the potential for IT to maximize revenue opportunities while minimizing operating costs.

IT and **business efficiency** issues include:

- ◆ Many surveys show today's resource usage ratio for IT infrastructure is only in the 20%-40% range
- ◆ Resource allocation for forecast peak load management often causes excess investment
- ◆ Dedicated systems for individual business applications create waste
- ◆ Unstructured or fragmented backup equipment creates liabilities
- ◆ Realtime business construction and unimproved business value
- ◆ Total Value of Opportunity (TVO) improvement.

Such targets must be addressed in pursuit of greater business efficiency.

Of course the promise of IT should go beyond individual benefits, such as mobility, continuity of service, reliability and reduced cost of ownership, to also support the growing need for enhanced **business agility**. Only then can it provide real business value and surpass being just the technical vehicle on which business processes are run.

IT and **business agility** issues include:

- ◆ The requirement for rapid response to new business change and requests
- ◆ Individual processes or process flows change, often significantly effects related components
- ◆ The time from requirement definition, business analysis and design, to business process cutover is too long
- ◆ Shortage of appropriate system design skill.

These targets must all be addressed in pursuit of greater business agility.

This new strategic perception of IT, which provides maximum agility for the implementation of new business changes and demands, is a major driving force for the future role of IT. It drives the desire to find technologies that enable utility level deployment and the least cost model that implies.

Yet despite the cost constraints, IT must also enable the organization to be a reliable service provider. In moving to a more ubiquitous "anytime anywhere" business environment, IT operations must also provide and ensure well-defined levels of service availability and quality. Consequently, high availability of the IT infrastructure is also an undisputed requirement in ensuring **business continuity**.

IT and **business continuity** issues include:

- ◆ Difficulty in adjusting the availability of systems consisting of multiple combinations of components for 100% availability
- ◆ Field-testing of all components is becoming unrealistic
- ◆ IT-related system management costs for service availability, operation and business process maintenance are too high
- ◆ The increasing number of incidents requires increasing intervention and cost.

Here Fujitsu's "mission-critical" mainframe principles and its embodiment of such mission-critical principles will best ensure the ability to achieve business continuity.

## **Chapter 2**

# **TRIOLE - Definitions**

## Chapter 2 TRIOLE - Definitions

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“TRIOLE is Fujitsu’s strategy for Optimized IT.”

TRIOLE is a combination of Fujitsu’s platform deployment and development strategy.  
TRIOLE enables the introduction of new forms of open and mission-critical IT infrastructure.  
TRIOLE enables the reuse of functional IT components for minimized TCO.  
TRIOLE enables faster adoption of new technologies and greater agility in business change.

As a result, TRIOLE’s overall customer-focused targets are:

- ◆ Increased **business efficiency** from cost-effective solutions
- ◆ Enhanced **business agility** with enabling a highly adaptive IT infrastructure
- ◆ Improved **business continuity** by delivering Fujitsu’s mission-critical know-how.

The three core technologies being used in TRIOLE implementations to achieve these functional targets are:

- ◆ **Virtualization**

Virtualization separates applications and data from dedicated hardware resources.

Hardware resources can then be pooled for more flexible and efficient usage, while at the same time reducing the effect of hardware change or malfunction on the business.

- ◆ **Automation**

Automation is about computers managing computers. It includes the enabling of systems and IT infrastructures to automatically adapt to changes in environment. Plus self-healing systems that maintain service continuity.

- ◆ **Integration**

Integration means the bringing together of Fujitsu and other world-leading products in pre-tested configurations, solution stacks and reusable platform building blocks, fully documented as templates. These are matched by service offerings for the delivery and possible customization of these templates for the specific design, build and operation of phased IT projects.

# **Chapter 3**

## **How TRIOLE contributes to optimized IT**

## Chapter 3 How TRIOLE contributes to optimized IT

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In today's multi-vendor system environments, many hardware and middleware products are found in combination. It is unlikely that the products of any one supplier will be in use 100%. This is because the user's perception is that flexibility and choice are more attractive than any potential for better control that comes from being limited to a single set of solutions from one supplier.

But using a wide variety of applicable products does make it difficult to maintain the consistency and compatibility of the products. This results in a significant amount of effort expended when developing a customer system for stable operation. Through TRIOLE, Fujitsu is creating a new form of open and mission-critical platform. Its openness gives customers the freedom to choose products with desired features while the use of templates retains knowledge and enables the reuse of global expertise. Such tested solutions ensure the development and deployment of stable systems in the shortest period of time.

TRIOLE realizes an optimized IT infrastructure by combining product technologies with stable platform integration based on techniques for developing and operating customers' systems.

TRIOLE moves the user towards IT optimization by its ability to absorb technology enhancements new product developments and new platform integration methodologies, along the way.

Fujitsu is applying TRIOLE's three core technology principles of virtualization, automation and integration to its products and system deployment methodologies. The aim is to produce new levels of compatibility and consistency that continue to further optimize entire IT infrastructure environments over time.

### 3.1 TRIOLE's Virtualization and Automation

"a guiding light for product and system development"

Virtualization enables the separation of applications from dedicated platforms. This reduces over-provisioning of hardware resources and creates new standards of resource efficiency that reduce the cost of ownership. It enables more accurate and lower-cost purchasing of additional equipment, easier and faster adaptation to change and the ability to provide operational flexibility.

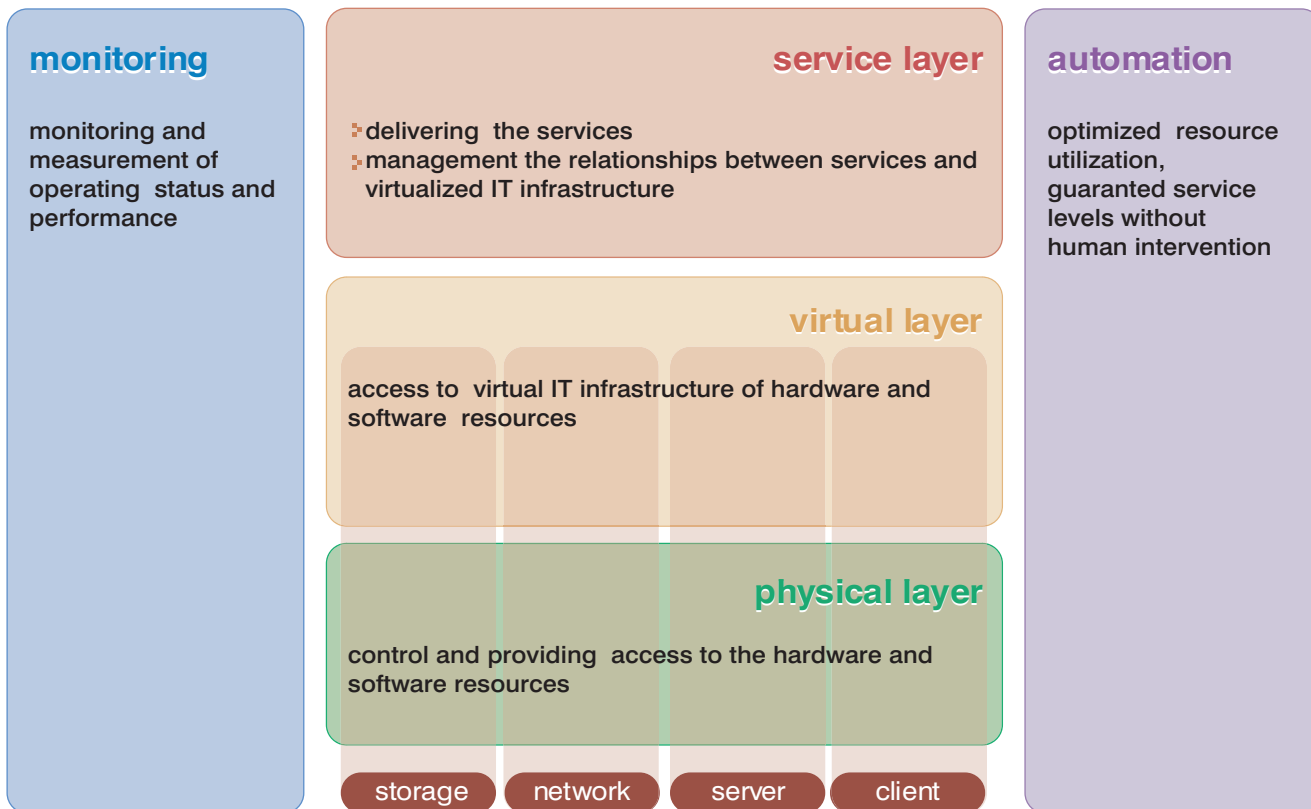
Importantly, the decoupling of applications from specific hardware allows the underlying platforms to be changed independently of the application. In turn, the application can also change without the underlying hardware having to be specifically reconfigured. The overall effect ensures less administration and simpler implementation.

Automation builds on Fujitsu's existing reliability credentials in self-managing and self-healing systems. Such automation further reduces the cost of ownership by removing another layer of cost from the administration and operational requirements of the IT infrastructure. It also improves business service continuity.

Importantly, the process is adaptive and provides for changing requirements through rules and policy adjustments. The results are simpler management, lower support costs, greater reliability and the ability to adapt with minimal reorganization.

The diagram below shows TRIOLE's architecture plus the major inter-related components of a TRIOLE-based implementation.

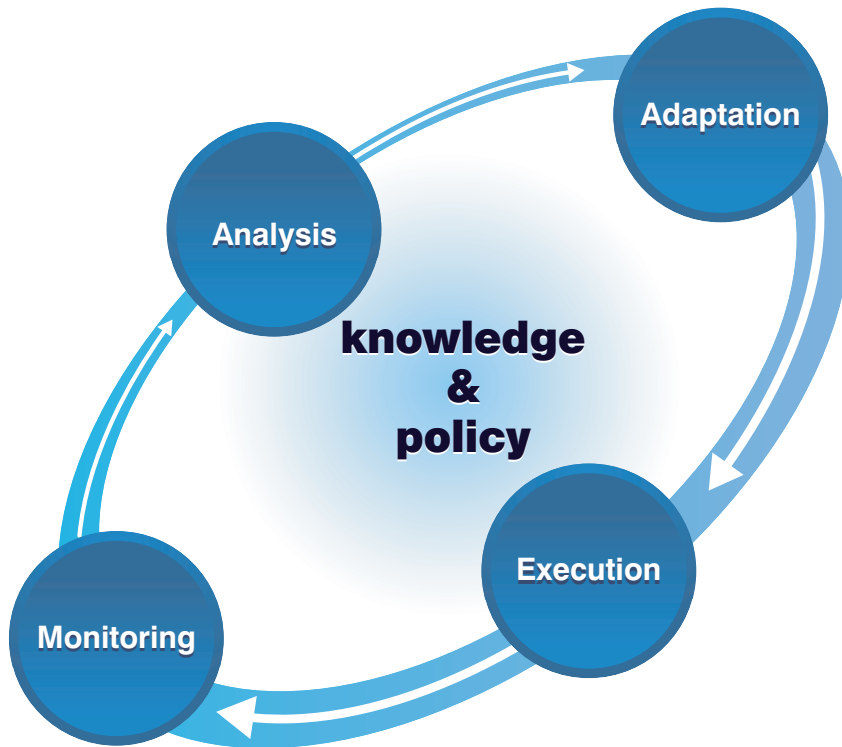
**Figure 1: TRIOLE' s architecture**



- ◆ **The Physical layer**  
This physical layer controls and provides access to the hardware and software resources available in the infrastructure.
- ◆ **The Virtual layer**  
This Virtual layer provides access to the virtual IT infrastructure of hardware and software resources, hiding implementation details, and enables sharing and higher utilization. This ensures consistent deployment / redeployment of all components of the IT infrastructure.
- ◆ **The Service layer**  
This Service layer delivers the services, with the quality defined in service level objectives, to realize utility computing, according to the principles “obtain what you need” and “pay as you go.” It also manages the relationships between services and virtualized IT infrastructure.

Advances in IT infrastructure will offer benefits, but without the correct levels of control they may not be adequately realized. TRIOLE offers two additional components through its monitoring and autonomic processes. These provide the feedback mechanisms that further ensure that what is delivered meets the requirements of the business. The automation function optimizes the resource utilization and guarantees service levels including security without human intervention.

The monitoring function then can oversee and measure operational status and performance as well as collect and correlate information about hardware, software, resources, services and security threats together.

**Figure 2: TRIOLE uses an autonomic feedback cycle**

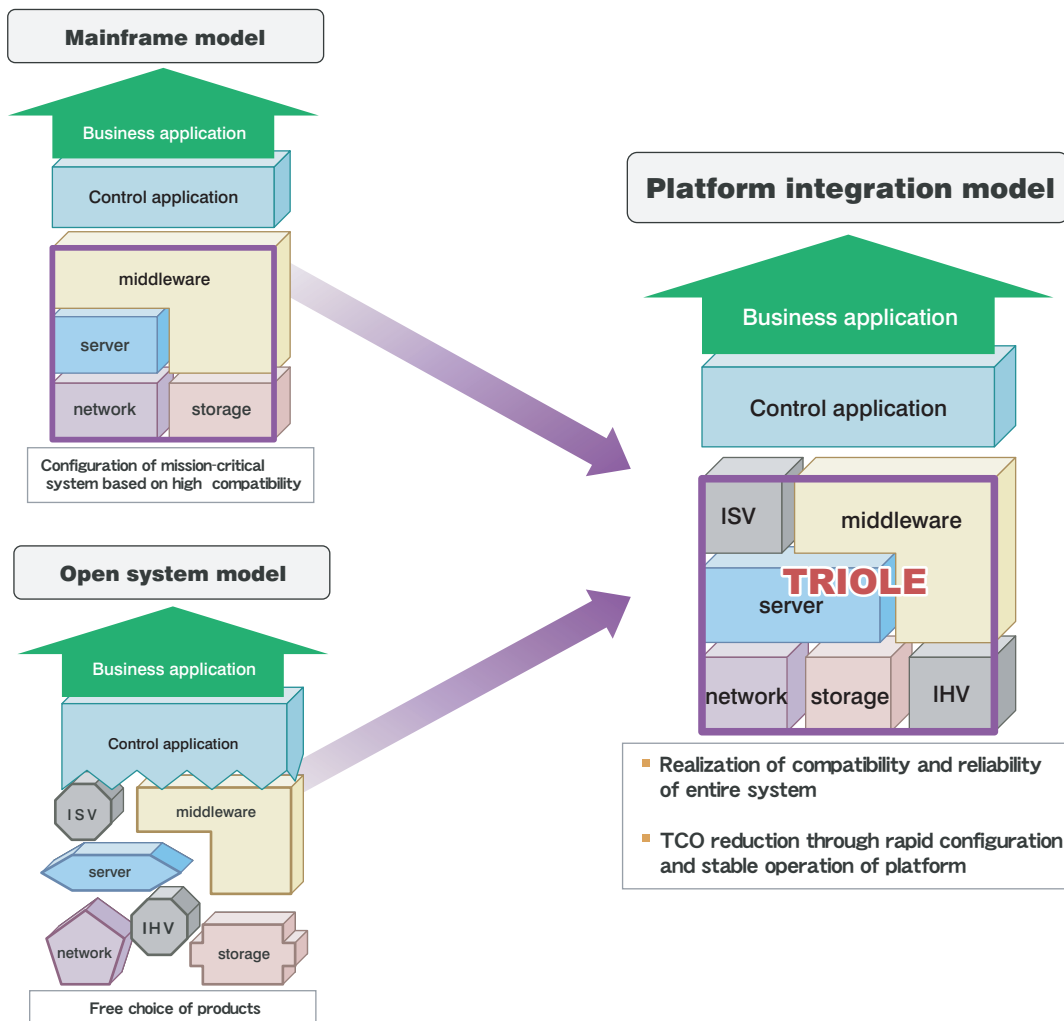
- ◆ **Monitoring**  
This delivers actual information about the resources.
- ◆ **Analysis**  
This is the deduction of conclusions from the actual information.
- ◆ **Adaptation**  
This contains the “intelligence” that configures the systems to optimize available resources and verify them before execution.
- ◆ **Execution**  
This is interpreting and performing the actions of the adaptation plan.
- ◆ **Knowledge**  
This is accumulated experience and understanding about items and relationships between items.
- ◆ **Policy**  
This is a set of rules or directives, either given directly or derived from a service level agreement or another high-level policy.

### 3.2 TRIOLE's Integration

“key to success in multi-vendor environments”

TRIOLE also overcomes the challenges of multi-vendor systems by integrating carefully selected and highly regarded ISV/IHV products with servers, storage, networks and middleware. TRIOLE enables integrated platform development as illustrated below. This achieves improved consistency and compatibility of the entire business IT system. It also delivers the stability and integrity of previous mainframe models with the best in class functionality of the open systems model. This is made fully possible by Fujitsu having mainframe level development technology and skill. This also enables TRIOLE platform construction in multi-vendor environments. Importantly, great significance given to partnerships with ISVs and IHVs, in particular in the area of working towards standardization.

**Figure 3: TRIOLE 's platform model**



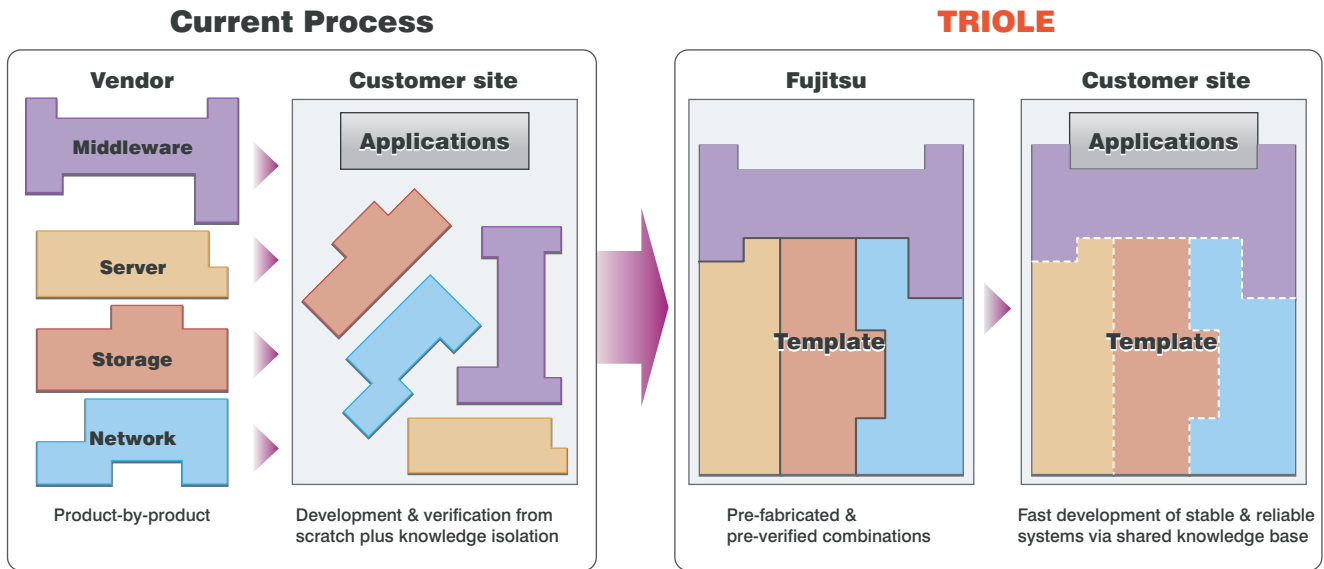
A key success factor in managing change is the ability to reduce the implementation period.

TRIOLE's building block concept provides the pre-fabricated building units of fast implementation. Pre-verified and certified by experts, using the best knowledge and skills, each building block delivers the server, storage, network and middleware products from Fujitsu and selected leading ISVs and IHVs, in suitable configurations.

The cost of implementation and time to implement are reduced. Quality and reliability are improved as the final result.

Even where tailoring is required, the templates are delivered through the service organizations of the Fujitsu group of companies. Matched service offerings can therefore adjust for specific requirements without having to develop such solutions from scratch. The result is the most effective implementation of new business process technology possible. Once again the discrete deployment of function with each template means that individual building blocks can be replaced over time with little or no disruption to other functions around them.

**Figure 4: TRIOLE reduces time to market**



# Chapter 4

## TRIOLE's way ahead

## Chapter 4 TRIOLE's way ahead

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### 4.1 Incorporation of Emerging Technologies

- ◆ **Grid Computing and TRIOLE**

Fujitsu is addressing the topic of Grid computing by its rigorous attendance at GGF.

This technology has started to be applied in such fields as research and development, life sciences and monetary analysis, where large amounts of computing power are required. Fujitsu will include Grid technology as a part of TRIOLE.

- ◆ **Utility Computing and TRIOLE**

Through TRIOLE, Fujitsu will be verifying the capability of utility computing from a range of perspectives, including the role of business models in the overall process and use of ubiquitous resource availability.

### 4.2 Long Term Strategy

TRIOLE provides an implementation program that allows an organization to move towards a utility computing model in manageable chunks.

TRIOLE then allows each, now discrete, infrastructure function to be improved, over time, using the latest and most appropriate technical innovations.

Today we are talking about Grid computing, web services, capacity-on-demand and process and resource ubiquity. However, how these technologies or ideas are adopted commercially will depend on a range of technical constraints and market forces. What is clear is that rather than inhibit the business process, TRIOLE structured IT can become a cost effective method of delivering that business process.

This means organizations will only change their IT infrastructure if doing so improves the bottom line. New technologies only need be adopted if they reduce the cost of doing business.

TRIOLE templates will create an environment of availability and stability, while increasing process automation for easier and lower cost management. In such an environment, the main IT requirement will be how easily the business can change and adapt.

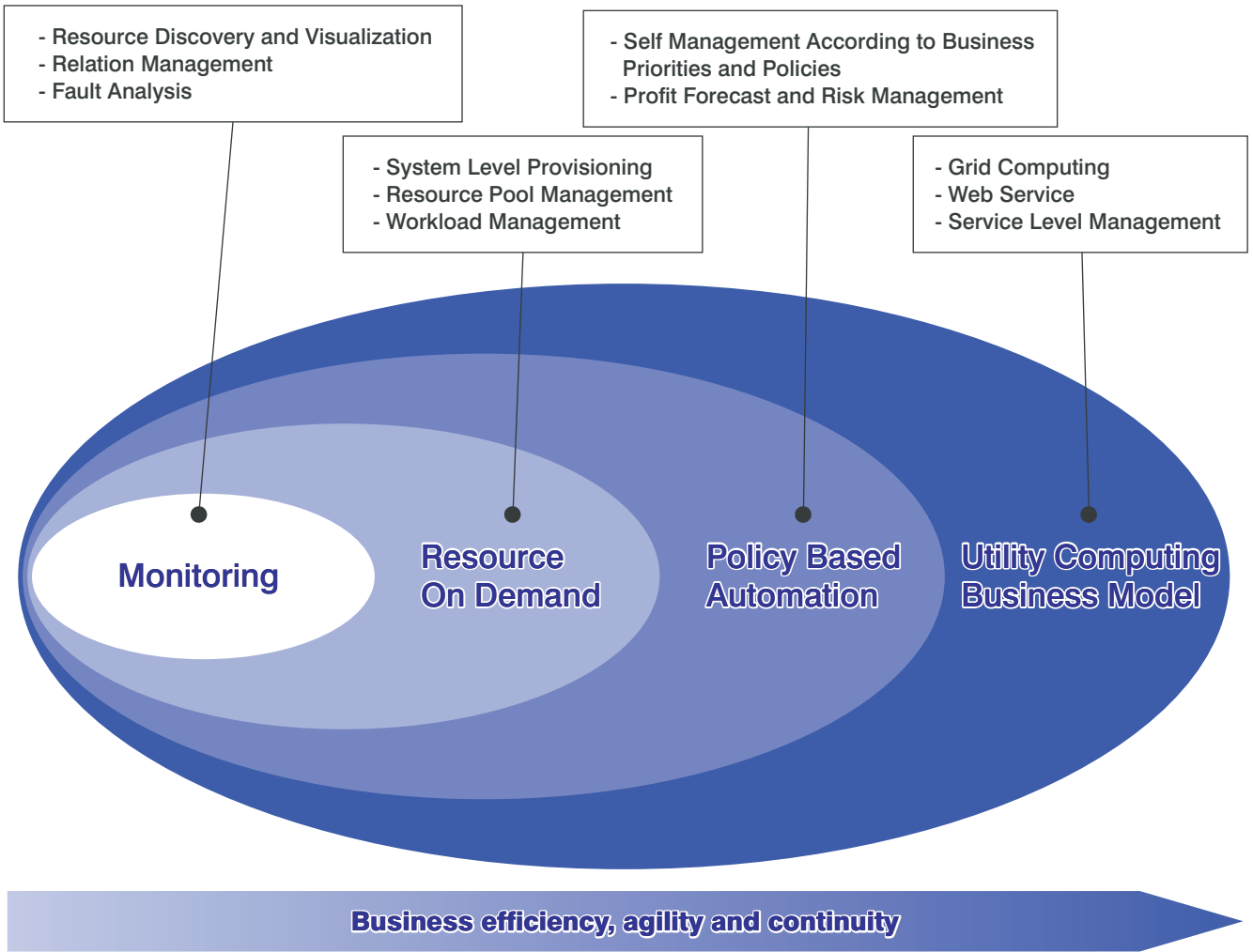
Fujitsu will use TRIOLE to deliver new functions and technology to its customers in manageable portions. The removal of the hard links between computing platforms and the business applications and functions will more easily deliver change and at a faster pace.

Fujitsu as a business partner will concentrate on delivering best practice services, configurations and building block solutions.

The three technology principles of TRIOLE - virtualization, automation and integration - will provide the basis for technology innovation with expertises as service supplier will deliver the skills and knowledge to ensure the robust, stable and flexible platform matched to the business and IT technology requirements at any point in time.

Via TRIOLE, implementations by Fujitsu customers will safely move along the road to new paradigms such as utility computing.

**Figure 5: TRIOLE enables the future**



TRIOLE is the first strategy for optimized IT that is practical, able to be adopted in discrete and manageable portions, and provides the capability to move to a future utility computing environment.

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# **Chapter 5**

## **Measures for the Environment**

## Chapter 5 Measures for the Environment

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The Fujitsu Group recognizes that environmental protection is a vitally important business issue. By utilizing our technological expertise in the IT industry and our creative talents, we seek to contribute to the promotion of sustainable development.

This development of Green Products featuring superior eco-friendly characteristics is accompanied by efforts to promote effective recycling by achieving the following: developing products that contribute to reduction of resource consumption, reuse and recycling; saving energy; and reducing chemical emissions throughout the product life cycle, not only in the design and manufacturing stages.

Fujitsu's exertions to develop technologies that help to reduce the environmental burden have borne fruit in terms of world's first results.

As an example, employing parts that consume less power for the server blade enabled us to realize low electric power consumption approximately just 1/5 that of conventional 1U servers.

# Chapter 6

## About Fujitsu

## Chapter 6 About Fujitsu

### 6.1 Corporate

Fujitsu is a leading provider of customer-focused information technology and communications solutions for the global marketplace. Pace-setting technologies, highly reliable computing and telecommunications platforms, and a worldwide corps of systems and services experts uniquely position Fujitsu to deliver comprehensive solutions that open up infinite possibilities for its customers' success.

Fujitsu is committed to impeccable corporate citizenship and is dedicated to making its solutions accessible in meeting the evolving needs of customers in an increasingly connected and convergent society.

Headquartered in Tokyo, Fujitsu Limited (TSE: 6702) reported consolidated revenues of 4.7 trillion yen (US\$44 billion) for the fiscal year ending March 31, 2004.

### 6.2 Credentials

Fujitsu is the No. 1 supplier of IT in Japan and the No. 3 systems integrator in the world. A leading supplier of highly reliable technology, it spends around 5% of its total value annually on research and development. The result is award-winning innovation and the holding of over 32,000 patents in the areas of electronic devices, platforms and software & services.

#### Fujitsu is a global total IT supplier

Fujitsu's competitive edge

- ◆ Fujitsu is the world's 3rd largest IT services company and Japan's market leader
- ◆ Fujitsu is the world's 5th largest server company and Japan's 2nd largest server company
- ◆ Fujitsu is the world's 4th largest integration application server company
- ◆ Customers include over half the Fortune Global 500
- ◆ Fujitsu/Hitachi Plasma Display is the world's No. 1 producer of PDPs for flat-screen TVs and information displays
- ◆ Sales and support operations in over 50 countries
- ◆ Total software/service staff: 69,000
- ◆ Major contributor to XML specifications and standardization (finance, insurance, automotive industry) and a leader in XML/Web Services-related business
- ◆ Full participant in GGF (Global Grid Forum) and co-chairman of major working group, contributing to establishment of Grid-based technology standards
- ◆ Also participates in a range of government projects focused on practical use of Grid, such as acquired technological and know-how being reflected in Fujitsu products and services
- ◆ Mainframe-based mission-critical technology background
- ◆ Vendors with years of high reliability mainframe design know-how are best equipped to fully understand the requirements of mission-critical infrastructure
- ◆ Integration by TRIOLE templates is a practical step to next generation computing.

# Glossary

\*1 ISV: Independent Software Vendor

\*2 IHV: Independent Hardware Vendor

\*3 Ubiquitous network: A network accessible anytime and anywhere from computers and from various mobile equipment such as cellular phones.

\*'Appropriate technology' means using the right technology for the job. In promoting technology change, it is often assumed that new technologies such as Grid computing or performance clusters are universal panaceas. This is probably untrue. It also tends to dismiss any technology used in previous generations of computers, however practical, such as self-management or high reliability circuits. As open systems took "best of breed" products to manage quality and functional deployment, Fujitsu's TRIOLE approach defines the best and most appropriate technologies to use in each reusable template, matched to the business infrastructure requirement.