Value Proposition of Newly Developed Mission-Critical IA Server PRIMEQUEST

● Akiyoshi Kurokawa   ● Yoshifumi Ogi

As today's broadband Internet society continues to evolve, market expectations for server platforms have changed. Aside from typical requirements for high reliability and high performance, customers also expect reductions in Total Cost of Ownership (TCO) and maximized Return On Investment (ROI). These end-customer benefits can be achieved through 24/7 non-stop operation, shorter recovery times, flexible system integration, improved efficiency by using open architecture products (including middleware and application software), easy migration, and improved maintainability and operability. Given its vast experience and know-how acquired over many years of developing mainframe and UNIX systems based on Linux/Windows and open-standard IA technology, Fujitsu (in conjunction with major global players) stands in the forefront of developing mission-critical IA servers capable of meeting market expectations. This paper describes the value propositions of the newly developed PRIMEQUEST mission-critical IA server, its features, technologies, and target markets.

1. Introduction

Many mainframes and UNIX servers have been used for public infrastructure and corporate mission-critical operations that require high reliability and high performance for extended periods of time. Failures of these systems could result in a huge disruption; therefore, they were required to provide stable, non-stop operation.

On the other hand, open-system IA servers are becoming increasingly popular as a way to reduce infrastructure costs, and the efficiency of technology development has progressed.

Fujitsu's PRIMEQUEST series of mission-critical IA servers incorporate the high reliability and high-performance technology that Fujitsu has developed over the years, and these systems can be deployed in mission-critical areas in which conventional IA servers have difficulty.

This paper describes the value propositions, technologies, and target markets of PRIMEQUEST.

2. Value proposition of PRIMEQUEST

Fujitsu's server strategy is to reduce Total Cost of Ownership (TCO) and maximize Return on Investment (ROI). These goals will be achieved by improving efficiency and providing solutions for new business through the pursuit of open systems, continuing to provide solutions by mission-critical operations, and expanding business on a global scale.

PRIMEQUEST is Fujitsu's third pillar: the other two pillars being the mainframe Global Server and UNIX PRIMEPOWER server. Global Server incorporates the various technologies and know-how that Fujitsu has acquired as a mainframe vendor. PRIMEPOWER is the culmination

FUJITSU Sci. Tech. J., **41**,3,p.277-283(October 2005)

277

of the high-reliability, high-performance technologies and know-how that Fujitsu has acquired over many years of developing mainframes and supercomputers. Solaris is used as the operating system, and many global standard applications are available. We are currently planning an additional global expansion by integrating Sun Microsystems, Inc. products in 2006. By maximizing PRIMEQUEST's open-system style of IA servers with Linux/Windows and combining the expertise acquired over many years of developing mainframes and UNIX servers, PRIMEQUEST achieves high reliability and performance (**Figure 1**). PRIMERGY, which is another Fujitsu IA server, also maximizes the open-system style of IA servers with Linux/Windows; however, it is intended for small or medium-scale implementations, while PRIMEQUEST is intended for large-scale or mission-critical tasks. Fujitsu has various lines of server products that can meet an assortment of client needs in a single location and provide the best platform solution in terms of performance, features, and cost.

Fujitsu has announced the following targets regarding mission-critical IA servers:

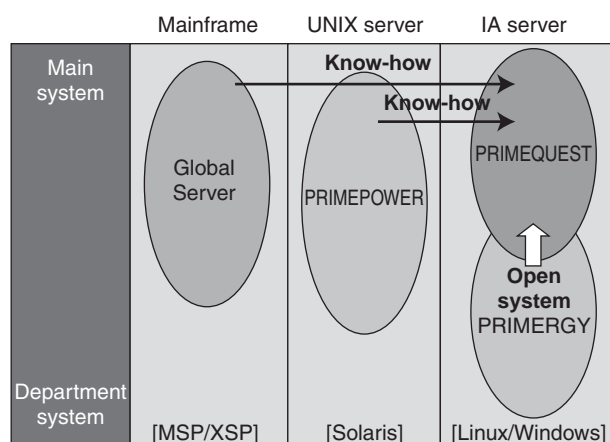1) October 2002: Step Up Linux Business Aimed at Large-Scale Enterprise Systems

2) January 2003: Work with Intel Corp. to Develop New Mission-Critical Enterprise Servers

3) May 2003: Form Joint Development Organization for Linux with Red Hat, Inc.

4) December 2003: Form Joint Development Organization for Linux with Red Hat, Inc.

5) June 2004: Deliver Mainframe-Class Capability with Microsoft Corp.

6) October 2004: Collaborate on Mission-Critical Linux Solutions with Veritas Software Corp.

7) April 2005: Unveil Mission-Critical Server for Linux and Windows

8) July 2005: Deliver Linux for High-Performance Servers with Novell, Inc.

In order to expand the open-system market, Fujitsu is promoting the establishment of an ecosystem (which is equivalent to an ecological system in a value chain) in cooperation with major global players to develop architecture, hardware, OSs, middleware, and applications. The following are the targets of cooperation:

2.1 Achieve high reliability and performance with standard Linux

Linux is independent from any specific IT vendor and is an open-source operating system in which clients' needs can be reflected via immediate and continuous enhancements by the Linux community, which Fujitsu actively participates in. Fujitsu is pursuing the standardization of a high-reliability and high-performance OS via activities in which mission-critical features are applied to standard Linux.

2.2 Intel high-end 64-bit processor

The system CPU of PRIMEQUEST is the 64-bit Itanium 2 processor, which Intel Corp. developed for the high-end server market. This processor has a 9 MB level-three cache and excels at parallelism and Reliability, Availability, Serviceability (RAS). It also has a much higher level of functionality, scalability, features, and reliability

Figure 1
Positioning of PRIMEQUEST.

than the IA-32 processor. The Itanium 2 processor is obviously superior to the IA-32 processor in applications that require high performance, for example, database and business systems (ERP/CRM/SCM). Also, by using IA-32 EL (Execution Layer) technology, existing 32-bit applications can be run on the Itanium 2 processor without modification. Therefore, this will not present any concern regarding conversion to the Itanium 2 processor.

Also, Intel Corp. and Fujitsu are co-developing PRIMEQUEST to expand the application area and are collaborating on promotional activities for Linux/Windows solutions for each of the major Independent Software Vendors (ISVs).

2.3 Dual Sync System Architecture (Dual Synchronous System Architecture)

The Dual Sync System Architecture is a Fujitsu-unique system architecture that completely duplicates the hardware of an entire system and runs the two parts in synchronization with each other. By using technology innovations based on this architecture, PRIMEQUEST combines the reliability of mainframes with a price performance beyond that of UNIX servers. This architecture is a core technology for implementing the System Mirror function described later.

2.4 Global expansion of PRIMEQUEST open system

The expansion of the PRIMEQUEST open system is being planned by globally co-developing OSs, solutions, and support with Red Hat, Inc., Novell, Inc., and Microsoft Corporation. Also, the advantage of an open system is that it can be combined with products from many ISV/IHVs (Independent Hardware Vendors) in order to obtain various solutions. This strategic cooperation has been tied with major ISV/IHVs.

The technologies of PRIMEQUEST, as deployed in mission-critical areas in which conventional IA servers have difficulty, are described in the next section.

3. PRIMEQUEST technologies

Because of the chaotic expansion of the Internet infrastructure, the reliability of the current three-layer server model has fallen and the operation costs have increased. Also, although basic performance has been enhanced by multi-core CPU multithreading, operation ratios have tended to decrease because decentralized server spaces cannot be used effectively. In addition, the costs of operation and maintenance, which are the dominant costs of a system including hardware and software, cannot be reduced. These are the major reasons why the ROI does not increase.

PRIMEQUEST, with its flexibility for both scale-up and server consolidation, enables the TCO to be reduced and the ROI to be maximized. Scale-up enhances a server's performance by increasing hardware resources such as the CPUs and memory. Scale-up provides advantages such as a simple system configuration and easy management, while server consolidation consolidates multiple small-scale servers in order to reduce the number of servers in use. Therefore, as the operating style is simplified, the cost is reduced.

PRIMEQUEST has flexible and stable partition configurations, and its I/O can be configured to suit the business style and processing amount. As a result, various combinations of servers can be realized with a single machine, ensuring high reliability and lower operation and maintenance costs as a system is expanded (**Figure 2**). The features that use this technology are described in the next section.

3.1 High availability
3.1.1 System Mirror function

Generally, RAID and cluster configurations are useful for enhancing the reliability of an IA server. Also, uninterruptible power supplies (UPSs) and backup devices are useful. However, these technologies cannot enhance the reliability of the system board (SB), which is the heart of a computer. By duplicating the components of
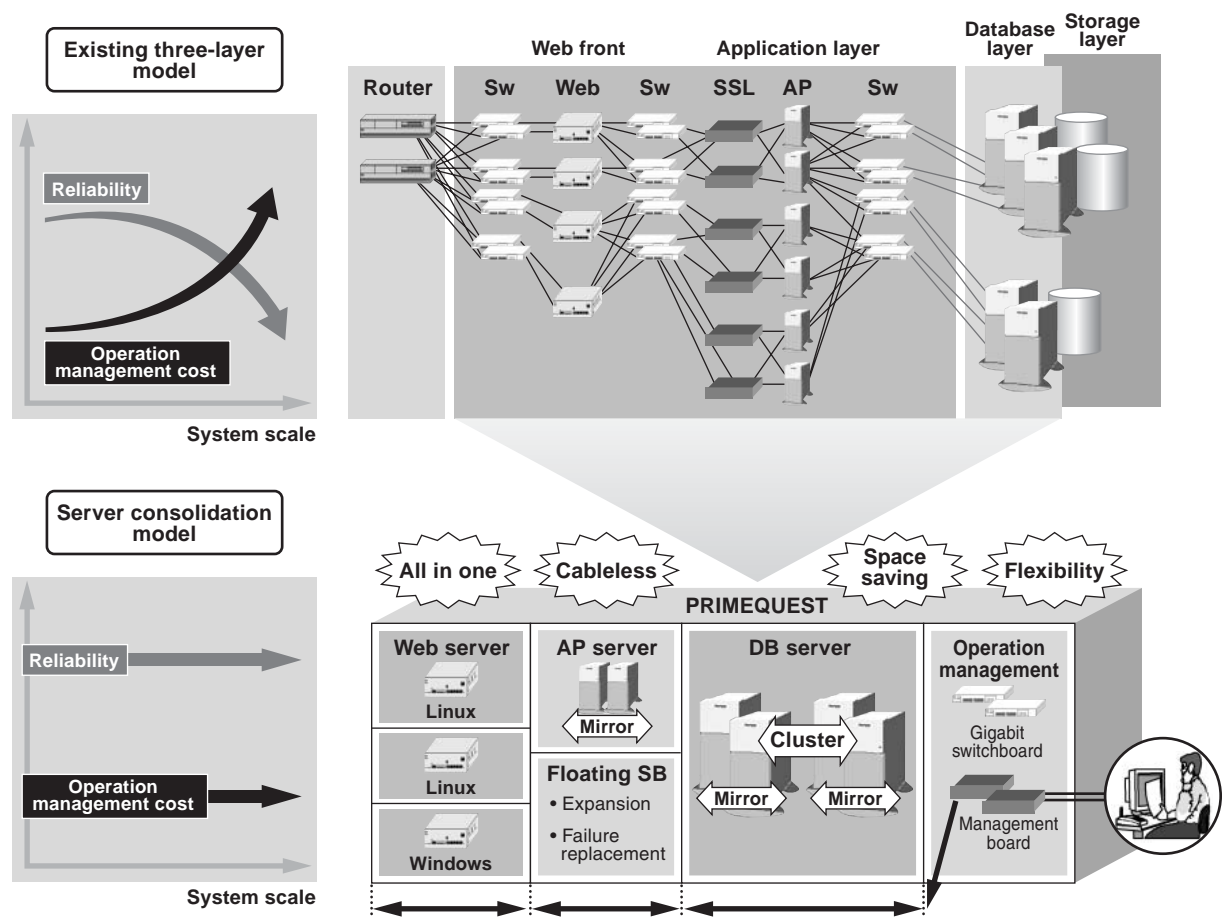
Figure 2
Server consolidation by PRIMEQUEST.

PRIMEQUEST's SBs and enhancing reliability, Fujitsu has enabled synchronous redundancy configurations on large-scale systems using a dedicated chipset. When the System Mirror function is used, a command from a CPU is synchronously executed by two duplicate systems. This makes it possible to detect failures of peripheral components and maintain normal functioning (**Figure 3**). Also, because these are hardware processes, business can continue as usual with no impact on the OS or applications. Moreover, in a cluster configuration, there is no downtime for failover and no time lag for recovery. By using the System Mirror function and clustering, PRIMEQUEST implements the highest level of availability with an operation ratio exceeding 99.999%.

3.1.2 Redundancy configuration and active maintenance

Active maintenance is a function that enables devices to be detached and attached for maintenance without stopping the system. In PRIMEQUEST, active maintenance is achieved by duplicating critical parts and units.

3.2 High performance and scalability
3.2.1 SMP (Symmetric Multiple-Processor) technology

SMP technology is a technique by which each processor plays the exact same role in a multiprocessor system so that each processor can process data in the same way. In PRIMEQUEST, several SBs equipped with CPUs and memory are combined. The structure is a large-scale SMP sys-
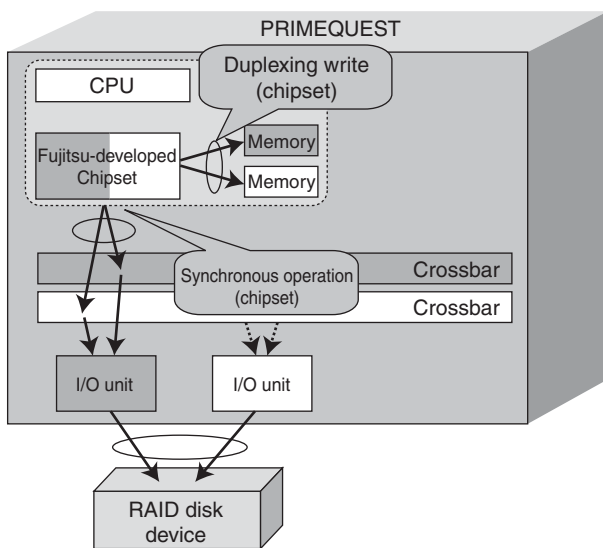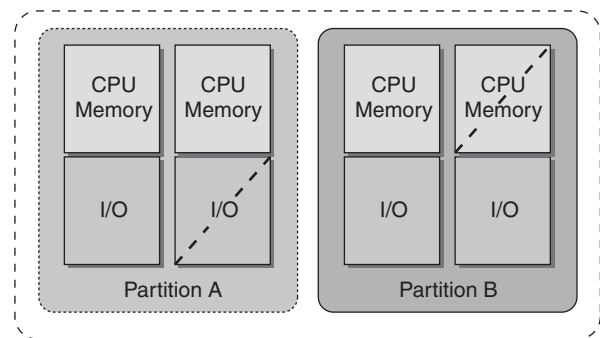
280

FUJITSU Sci. Tech. J., **41**,3,(October 2005)

Figure 3
System Mirror function.

(a) Without Flexible I/O

(b) With Flexible I/O
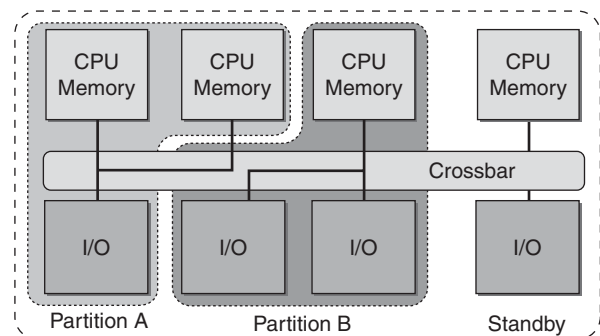
Figure 4
Flexible I/O.

tem that supports a maximum of 32 CPUs. By including the large-scale SMP technology and very-high-speed crossbar technology acquired over many years of developing mainframe and UNIX systems, PRIMEQUEST achieves the high performance required for large-scale, mission-critical systems.

3.2.2　Flexible I/O

The Flexible I/O is a technology that connects SBs and flexible I/O devices. In an ordinary UNIX server and IA server, each SB is connected to each I/O device. Depending on the load from applications and the business function, some of the resources of the SBs and I/O devices may be unused. Also, the configuration cannot be flexibly modified to accommodate facility increases or system changes. **Figure 4 (a)** shows an example in which the Flexible I/O is not used and there is an I/O device surplus in partition A and a redundant CPU and memory block in partition B. **Figure 4 (b)** shows how the Flexible I/O optimizes the resources of the whole system by changing the SBs and I/O devices to suit the operation style.

3.2.3　Partition feature

The partition feature divides a cabinet into several units so an independent system can be run in each unit. With this feature, various-sized partitions can exist within the same cabinet and different OSs or different versions of an OS can be run. This feature enables costs to be minimized as various businesses are integrated.

3.3　Operability and maintainability
3.3.1　Management board

PRIMEQUEST has a duplicated management board (MMB) that has a server management feature. This feature enables single-point management of several partitions, monitoring of the hardware status, display of configuration and error information, management of the network environment, and electrical power control. The server management feature dramatically reduc-

FUJITSU Sci. Tech. J., **41**,3,(October 2005)

281

es the cost of management without the need for a dedicated management server or software.

3.3.2 Cableless design

PRIMEQUEST can accommodate Gigabit switchboard (GSWB), Management LAN, KVM (Keyboard/Video/Mouse) interface units, and associated wiring within its cabinet (**Figure 5**).

Typically, these types of peripheral equipment are connected with external cables, and adding or changing partitions involves physical work on these cables. In PRIMEQUEST, other than the connections to the power supply and external ports, physical cabling work is not required because all of the preparations, including the LAN setup, can be completed using the MMB. This dramatically improves reliability because problems such as deterioration and incorrect location of physical connections do not occur. Moreover, it makes it easier to add partitions and make system configuration changes.

3.4 Support

3.4.1 Long-term support

Regarding OSs whose source code is not publicly available, support content depends on the OS vendor. Linux is open source, and the source code is available; therefore, Fujitsu is responsible for it and can provide long-term support.

3.4.2 Cooperation with OS distributors

Fujitsu has formed a strategic affiliation with Red Hat, Inc., and this is Red Hat's first cooperation with a Japanese company. Fujitsu staff members are working in the Joint Development Organization within the Red Hat development office. Through their close relationship with the US staff, Fujitsu has established a system that immediately analyzes and handles critical failures. Also, with the cooperation of Novell, Inc. and Microsoft Corporation, mission-critical applications will be developed and supported.
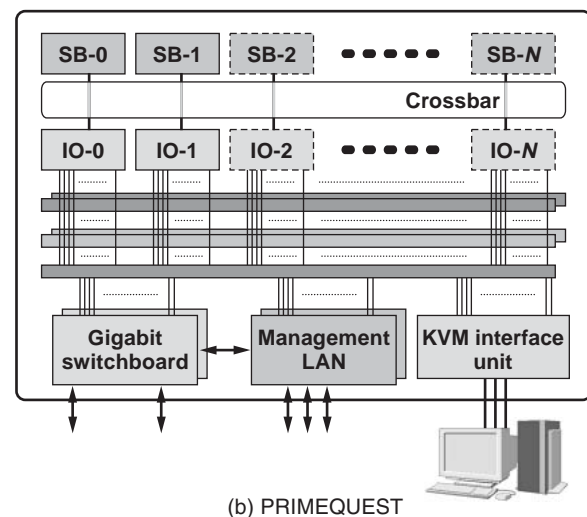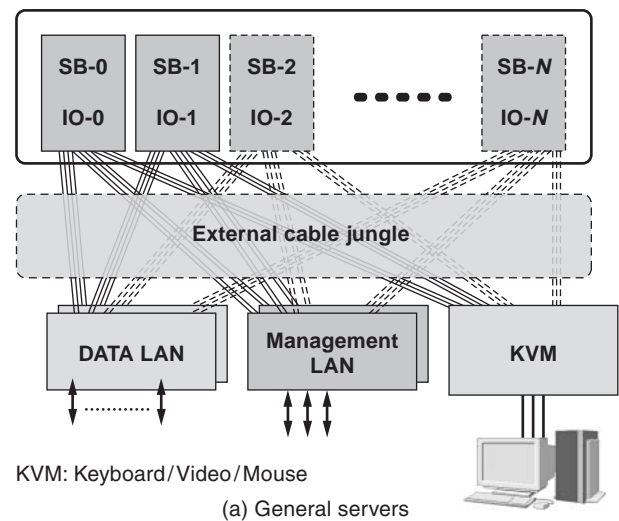

KVM: Keyboard/Video/Mouse

(a) General servers

(b) PRIMEQUEST

Figure 5
Cableless design.

4. Target markets

PRIMEQUEST has been intended for global expansion since the start of its development. A marketing system and support system have been established between Fujitsu in Japan and Asia Pacific, FSC (Fujitsu Siemens Computers) in Europe, and FCS (Fujitsu Computer Systems) in North America. PRIMEQUEST can be used in various ways, for example, in transitions from mainframes to open systems; in solutions for large-scale, mission-critical systems with open platforms; and for HPC (High-Performance

Computing). However, the principal targets are the following:

1) Open-system, mission-critical server market

This market targets new open-platform, large-scale mission-critical databases and ERP (Enterprise Resource Planning) systems. We would like to emphasize the two features of scale-up and server consolidation because they are typically unavailable in this market.

2) Server consolidation market

This market targets the centralization of servers located at branches and the consolidation of the platforms of each type of business server. The ability to flexibly configure partitions and I/O according to the business style and processing amount make PRIMEQUEST particularly attractive in this market.

3) Market migration from existing proprietary systems

Many mainframes have been used in mission-critical areas, and we are targeting this business area.

5. Conclusion

This paper described the goals, features, technologies, and target markets of PRIMEQUEST, the next-generation server platform from Fujitsu. The open-system, mission-critical market for which PRIMEQUEST is targeted is currently undeveloped; however, it is expected to have the most potential for future growth. We will expand our global business through the strong relationships we have with our major partners and our development leadership.

Akiyoshi Kurokawa received the B.S. degree in Mathematics from Waseda University, Tokyo, Japan in 1985. He joined Fujitsu Ltd., Kawasaki, Japan in 1985, where he has been planning and developing enterprise server systems.

Yoshifumi Ogi received the B.S. degree in Electronics Engineering from the University of Tokyo, Tokyo, Japan in 1981. He joined Fujitsu Ltd., Kawasaki, Japan in 1981, where he has been planning and developing enterprise server systems. He is a member of the Information Processing Society of Japan (IPSJ).

FUJITSU Sci. Tech. J., **41**,3,(October 2005)

283