



# FUJITSU Server PRIMEQUEST 2800E

~Fujitsu's Mission-Critical x86 Server~

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# Measure Three Key Factors That Affect Mainframe Migration Cost and Risk

The success of mainframe migration projects is a result of understanding the size, complexity and heterogeneity of the application. These three criteria will help CIOs understand the appropriate modernization approach and platform selection.

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## Key Challenges

- >>Understanding the size, complexity and heterogeneity of an application can be difficult in the face of an aging portfolio that has received minimal focus over many years.
- >>A decreasing level of in-depth application understanding increases the difficulty of obtaining functional equivalence, at a minimum, in the replacement system.
- >>Identifying skills concerns and support risks based on application technology decisions about existing systems from as far back as perhaps the 1960s is a challenge.

## Recommendations

- >>Determine the size, complexity and heterogeneity of a proposed mainframe application to drive identification of migration risks and approaches, as well as platform selection.
- >>Apply Gartner's tolerate, invest, migrate, Eliminate (TIME) model, in conjunction with an understanding of these three criteria to help refine the steps and risks for migration based on the selected modernization strategy.
- >>Use a pace-layering approach to help begin the partitioning of applications and to identify potential approaches for modernizing them.

## Introduction

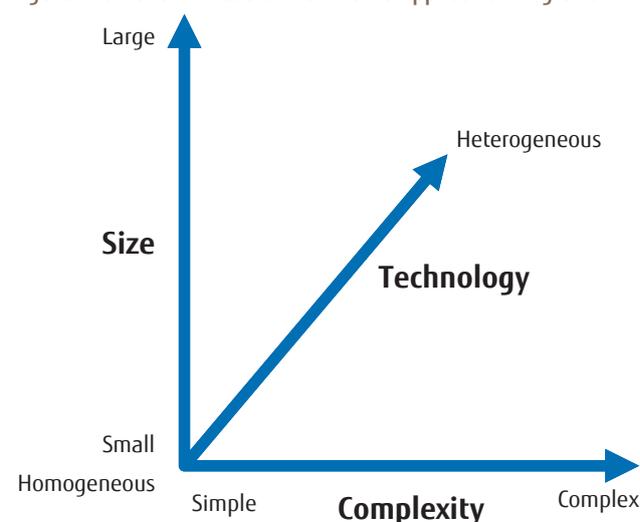
As organizations make decisions to migrate workloads from their legacy mainframe environments to newer, more modern architectures, they should consider the difficulty of extricating themselves from, perhaps, decades of architectural dependence. There are several business and technological drivers that are leading many companies to the conclusion that legacy modernization efforts can no longer be postponed or ignored. Mainframe migrations have a cultural aspect to the migration that must be considered. While many technical differences impact such migrations, the impact of such a change on people

and the processes they use to deliver and operate applications is significant. The roles, skills and cultural differences between the mainframe platform and its related application and operational architectures and Windows or Unix/Linux environments need to be rationalized as part of the migration.

The ease with which applications can be moved is a function of two areas: infrastructure and application technology. Moving workload from a mainframe to a Windows or Linux distributed scale-out architecture presumes an organization

has a well-managed, highly reliable infrastructure of this type already. If not, this must be developed in parallel with the efforts to migrate the application workload. The ease with which an organization can move an application is a function of three criteria – size, complexity and heterogeneity (see Figure 1). Evaluating each application individually can help establish the risks involved in any migration. When the organization desires to move some mainframe workload as a way to free up MIPS, eliminating continued acquisition of more general-purpose engines from IBM, examining the three criteria will help identify the easiest applications to move. This does not mean these applications will yield the highest MIPS savings; only that they are the easiest and least risky to move.

Figure 1. Criteria for Ease of Mainframe Application Migration



Source: Gartner (May 2014)

## Analysis

### Determine the Size, Complexity and Heterogeneity of a Proposed Mainframe Application

Understanding the size, complexity and heterogeneity of mainframe applications can help drive the migration planning process and risk evaluation. It can also be used to frame the migration costs. CICS/COBOL applications with less than 1,000 MIPS are the easiest, least risky environments to migrate. Greater size, complexity and heterogeneity suggest a more involved migration process consisting of a combination of multiple migration approaches. Some workloads may be easily rehosted. Other applications may require a code transformation solution (see "Ease IT Modernization by Addressing Code Migration Issues Upfront"), and some may be migrated via a conversion to a packaged software solution.

#### Defining Application Size

Size can be measured in terms of:

- Lines of code, function points or use-case points (see "How to Choose a Sizing Framework to Measure Productivity")
- MIPS consumption
- Transaction volume
- Batch processing volume
- Application data

When evaluating applications for migration, size is one of the factors to be considered, but not always

the most important one. Larger volumes of homogeneous, single-language lines of code are less problematic than smaller volumes of heterogeneous, multilanguage systems. A single application that may have many lines of code but supports few transactions or batch jobs is easier to migrate than the alternative. Understanding the size, as defined by these various components, provides some insight not only into the size of infrastructure necessary to support this workload, but also into the migration options that are the easiest to perform.

Rehosting technology provides an emulation environment that runs on distributed platforms and simulates the mainframe operating environment (see "Rehosting Mainframe Workloads in the Cloud"). This emulation capability minimizes the amount of change that must occur when migrating many systems to a distributed platform. For example, most rehosting solutions emulate Customer Information Control System (CICS) or Information Management System (IMS) APIs so that transactional programs do not have to be re-engineered. For batch processing, job control language (JCL) can be interpreted natively by some rehosting products, whereas others convert



JCL to a scripting language with built-in extensions to support IBM JCL-specific capabilities. Support for security, basic mainframe file types and Virtual Storage Access Method (VSAM) are generally provided by vendors. The goal of rehosting solutions is to minimize the change and maximize the reusability of mainframe applications.

Rehosting solutions provide a relatively low-cost and low-risk way to reduce mainframe operating costs when the application technology is fairly homogeneous. They minimize the amount of change in original legacy applications, while maintaining the business value they provide. Organizations can continue to leverage their COBOL skill sets, because these solutions maintain this language, albeit in a slightly different way.

### Defining Application Complexity

Complexity can be defined in terms of:

- Cyclomatic complexity
- Essential complexity
- Number of interfaces
- Business rules
- Proprietary run time

Applications that are complex are more difficult to move because they involve a heavy amount of additional effort beyond what any automated solutions may do. Applications with a large number of interfaces must be reconnected with all their existing partners after they have been moved to a new platform. Support for the particular interface technology must be evaluated for availability in the new environment. Data encoding differences may be introduced (for example, EBCDIC versus ASCII) when moving from mainframe to distributed platforms. While these issues are solvable, they introduce an additional level of effort beyond the moving of the application to a new runtime infrastructure.

Those applications that are dependent on a proprietary runtime environment on the mainframe, such as CA Technologies' CA Gen, Software AG's Natural or other COBOL generator solutions, also add a level of complexity to the migration. Some solutions will emulate the runtime environment in order to ease the migration, while some will generate new code to

provide the same kind of capability.

### Defining Heterogeneity

Homogeneity or heterogeneity of a mainframe application is measured in terms of:

- Third-generation language (3GL)/fourth-generation language (4GL)
- Prerelational DBMS
- Assembler
- Proprietary data access

Applications that consist of a number of different underlying technologies can also be difficult to migrate. Early 3GLs or native platform IBM/370 Assembler are often very specifically tied to the IBM mainframe runtime architecture. Moving these applications requires not only a language transformation, but also a rearchitecting that replaces any mainframe-specific processing with some alternative solution. The effort to understand these dependencies and evaluate proposed solutions adds to the complexity of any application migration.

Prerelational DBMSs almost always require migration from their current networked, hierarchical or inverted list architectures to a relational table structure. This effort requires the need for an acceptable schema definition, but also implies a data cleansing effort and a solution for the database navigation logic in the application (see "IT Modernization Presents Data Migration Issues").

## Use Pace-Layering to Begin Partitioning Applications and Identifying Potential Modernization Approaches

While the three criteria of size, complexity and heterogeneity help define the migration risks, a pace-layering approach should be used to recognize the different purposes of applications and to clarify the desired modernization strategy.

Developing a Pace-Layered Application Strategy requires deconstructing your portfolio into individual applications, and identifying the specific business functions each application supports. The characteristics of applications and processes are used to determine whether they should be classified as systems of record, systems of differentiation or systems of innovation.

The main components of the pace-layer model are:

>>Systems of record: Established packaged applications or homegrown legacy systems that support core transaction processing, and manage the organization's critical master data. The rate of change is low, because the functions are well-established, common to most organizations, and often subject to regulations and recommended practices. These systems are normally considered more permanent and stable, with typical time frames of up to and more than 10 years.

>>Systems of differentiation: Applications that enable unique company functions or industry-specific capabilities. They have a medium life cycle (one to three years), but need to be reconfigured frequently to accommodate changing business practices and customer requirements.

>>Systems of innovation: New applications that are built on an ad hoc basis to address emerging business requirements and opportunities. These are typically short-life-cycle projects (up to 12 months), using departmental or outside resources and consumer-grade technologies.

>>Connective tissue: The technologies that enable the three layers to interact (see "Connecting Technology for a Pace-Layered Application Strategy"). These connective technologies typically are tools that tie applications together, provide a means for organizations to extend the value of their applications, and/or create new capabilities on top of current portfolios. Common technologies that come under the connective tissue banner include business intelligence, corporate performance management, enterprise information management and service-oriented architecture (SOA; see "SOA Enables a Pace-Layered Approach to Applications").

By understanding the portfolio in this way, organizations can make modernizations appropriate to the benefits inherent in each of these application types. Modernization approaches for systems of record may focus on cost control, since these applications provide little to no differentiation. Moving these applications to lost cost platforms or perhaps migrating to packaged software solutions will help define the cost, effort and risks when modernizing these applications. The three criteria mentioned in this note are then used to further clarify the modernization risks.

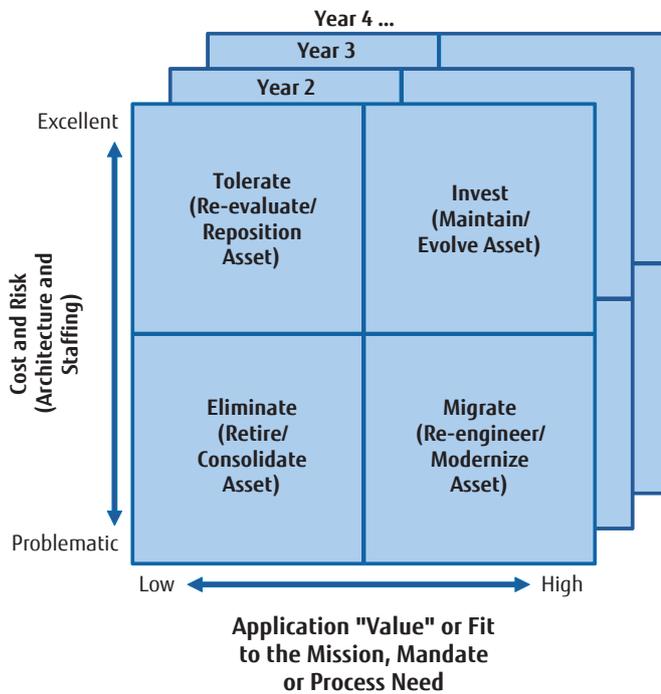
By identifying those business functions that could be used to differentiate or innovate, organizations could extract those functions from the existing systems of record, enabling faster implementation and focus on those things that matter to the business (see "Toolkit: Pace-Layered Application Strategy Starter Presentation").

## Apply Gartner's TIME Model to Make More Informed Modernization Decisions

All applications are not created equal, and the appropriate modernization strategies should not be the same for all of them. Gartner's TIME model (see Figure 2) differentiates between strategies of tolerate, invest, migrate or eliminate. For some applications, the best modernization approach is to retire or decommission the application. For others, migration to lower-cost platforms or more

modern technology may be appropriate. Others may be better-suited to the organization if their business process is implemented in a packaged software solution. The TIME model describes a way to identify these various approaches, and for which applications they are most appropriate.

Figure 2. Gartner's TIME Model for Modernization



Source: Gartner (May 2014)

## Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"How to Develop a Pace-Layered Application Strategy"

"ITScore for Application Organizations: Application Portfolio Management"

"Toolkit: Pace-Layered Application Strategy Starter Presentation"

"Use the Pace-Layered Application Strategy to Understand Your Applications Portfolio"

"SOA Enables a Pace-Layered Approach to Applications"

"How to Develop Your Applications Portfolio Using the Pace-Layered Model"

### Acronym Key and Glossary Terms

<b>Cyclomatic Complexity</b>	Cyclomatic complexity is a measure of the complexity of a module's decision structure. It is the number of linearly independent paths and therefore, the minimum number of paths that should be tested. (Source: <a href="#">McCabe IQ Research Library</a> .)
<b>Essential Complexity</b>	Essential complexity is a measure of the degree to which a module contains unstructured constructs. This metric measures the degree of structuredness and the quality of the code. It is used to predict the maintenance effort and to help in the modularization process. (Source: <a href="#">McCabe IQ Research Library</a> .)

# Datasheet

## FUJITSU Server PRIMEQUEST 2800E

### Mission Critical



The mission critical open system FUJITSU Server PRIMEQUEST provides high-end server functionality using superior Fujitsu technology, long cultivated and refined over generations of computer system development.

#### The most cost-efficient enterprise server

The mission critical x86 server FUJITSU Server PRIMEQUEST 2800E is a high-end data center system focused on the needs of the growing enterprise. Based on technologies and innovations Fujitsu has refined over generations of highly reliable mainframe and UNIX servers, it provides mission critical class high-performance, excellent service availability and the openness of x86 servers.

Global standard Linux® and Microsoft® Windows® operating systems, with highly advanced Fujitsu reliability, stability and manageability technologies, make PRIMEQUEST a highly cost effective mission critical open platform.

Customer investment is fully secured by:

- Ability to operate a 24-hour, 365-day business.
- Outstanding performance and reliability.
- Excellent flexibility and scalability in an open server.
- A radically improved cost/performance profile.
- Use optimization and scalability for the future.

#### High availability

With outstanding redundancy, PRIMEQUEST 2800E provides the high uptime required from true enterprise platforms. The heart of the server, the system boards including CPUs and memory modules, can be instantly recovered on failure, enabling smooth operation of mission-critical workloads. In fact, almost every component can be redundantly configured.

This new PRIMEQUEST 2800E is the first open server platform which enables online addition and replacement of system boards and I/O boards.

Under the strict quality standards in Fujitsu's process from server design, quality assurance manufacturing and support, PRIMEQUEST 2800E dramatically reduces failure.

Using Intel® Xeon® E7-8800 v2 product family and Fujitsu's cutting-edge I/O technologies, PRIMEQUEST 2800E has hit highest performance scores in the large systems server arena. This is further evidence that Fujitsu can deliver best of breed products, conforming to open systems standards that handle enterprise workloads. For instance, PRIMEQUEST 2800E combined with variety of Solid State Drive products can leap data throughput compared to what existing mission critical servers could provide.

#### High performance per cost

Based on state-of-the art technologies such as smart cooling, Intel® processors and other cutting-edge components, PRIMEQUEST 2800E provides the best cost-efficiency in the enterprise server arena. It also reduces data center costs by lowering power consumption and minimizing server footprint.

PRIMEQUEST 2800E can also free system administrators from the risks and complicated steps of system virtualization. Physical partitioning does not require performance testing or a "Plan B". New partitions can be mixed with software virtualization environments such as VMware vSphere™ 5, Hyper-V, and Red Hat® Enterprise Linux® KVM.

PRIMEQUEST 2800E with its high availability, performance scalability, cost-efficiency, and risk-free virtualization can lift the Return on Investment (ROI) of your IT system.



Main features	Benefits
<p><b>Complete redundancy and online recovery function</b></p> <ul style="list-style-type: none"> <li>■ Almost all components can be redundantly configured</li> <li>■ Unique redundancy at the heart of server, including system boards and system interconnects, to offer greater protection</li> <li>■ System Boards or I/O Units can be replaced online if any of them fails</li> </ul>	<ul style="list-style-type: none"> <li>■ Systems on PRIMEQUEST 2800E can continue operation even if a component fails</li> <li>■ PRIMEQUEST's unique levels of redundancy eliminates such causes of major system failure making it suitable for enterprise operation</li> <li>■ System can recover from failure without system interruption by Dynamic Reconfiguration</li> </ul>
<p><b>Highest data throughput in mission critical arena</b></p> <ul style="list-style-type: none"> <li>■ 2.5 times the performance of predecessor model</li> <li>■ Highest level of database performance in Mission Critical arena</li> <li>■ High performance for computation, memory access, and I/O access</li> <li>■ High data throughput even for very large data</li> </ul>	<ul style="list-style-type: none"> <li>■ PRIMEQUEST 2800E with 2.5 times the performance scalability can accommodate higher enterprise workload</li> <li>■ PRIMEQUEST 2800E can satisfy customers demand to expand business platform without disruption</li> <li>■ Max. 1.9 Peta bytes of SSD storage capacity for processing large amounts of data</li> </ul>
<p><b>Only grow as you need</b></p> <ul style="list-style-type: none"> <li>■ Online addition of System Board or I/O Units can increase performance in simple manner</li> </ul>	<ul style="list-style-type: none"> <li>■ Customers can save money for system investment until business growth requires system expansion</li> </ul>
<p><b>Rich variety of I/O products</b></p> <ul style="list-style-type: none"> <li>■ Solid State Drive products for disk drives and flash memory connected through PCIe are available to accommodate customers demands such as cost efficiency and high performance</li> <li>■ Infiniband helps scale out database system without sacrificing performance</li> </ul>	<ul style="list-style-type: none"> <li>■ For demands for cost-efficiency and performance upgrade, SSD disk drives are the best solution</li> <li>■ For demands for high performance upgrade, users can choose to install PCIe SSDs</li> <li>■ PRIMEQUEST with Infiniband can scale up Oracle Database</li> </ul>
<p><b>Protect confidential data</b></p> <ul style="list-style-type: none"> <li>■ Even if confidential data is stolen, the stolen data cannot be used maliciously</li> </ul>	<ul style="list-style-type: none"> <li>■ Intel® Xeon®'s on-chip encryption greatly reduces encryption/decryption time making database encryption a practical solution for protecting intellectual property</li> </ul>
<p><b>Lower operational costs</b></p> <ul style="list-style-type: none"> <li>■ PRIMEQUEST 2800E can halve reduce power consumption compared to predecessor model at similar performance</li> <li>■ PRIMEQUEST with compact chassis reduced its dimension from 12 to 10 rack unit can reduce data center space and foot print</li> <li>■ With high performance Intel® Xeon® E7-8800 v2 product family and cutting-edge I/O technology, PRIMEQUEST provides high performance with small number processor cores</li> </ul>	<ul style="list-style-type: none"> <li>■ As server resource utilization changes, PRIMEQUEST 2800E power consumption stays low, as it only consumes power according to its application workload</li> <li>■ PRIMEQUEST help reduce costs for datacenter space</li> <li>■ PRIMEQUEST can save costs more for Oracle DB license and support charge compared to other Mission Critical Servers for similar performance</li> </ul>
<p><b>Simplified server lifecycle management</b></p> <ul style="list-style-type: none"> <li>■ An integrated suite of tools takes care of servers and their component products in your datacenter over the entire life of the server</li> </ul>	<ul style="list-style-type: none"> <li>■ Human resource costs for server management, including: installation, integration, monitoring, maintenance, and upgrading are reduced</li> </ul>
<p><b>Risk-free virtualization</b></p> <ul style="list-style-type: none"> <li>■ Up to four physical partitions</li> <li>■ Physical partitions and software virtualization products can be mixed in the same server</li> <li>■ Standard virtualization products such as VMware vSphere™ 5, Hyper-V, and Red Hat® Enterprise Linux® KVM are supported</li> </ul>	<ul style="list-style-type: none"> <li>■ Customers undertaking system virtualization for the first time, Physical Partitioning is the best entry strategy, as there are no performance overheads and no incompatibilities with applications</li> <li>■ Once confident with virtualization, customers can then integrate other standard virtualization products onto the same system</li> <li>■ A wide variety of ISV products is available including the major and popular virtualization products</li> </ul>

## Topics

### Almost every component redundant

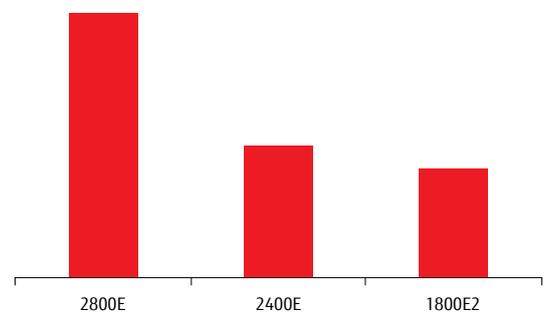
With PRIMEQUEST 2800E, your most important business operations can be strictly protected from errors:

- Partitions using multiple system boards (SB) can continue operation even if one full system board fails. The failed system board can be immediately replaced by a Reserved System Board. This means normal service levels can be very quickly resumed
- Dynamic Reconfiguration help recover from failures on System Boards or I/O Units without system stoppage
- Memory can be mirrored. This means that even if a memory failure occurs the application will continue using the correct data. With Double Data Device Correction (DDDC), even if two memory chips fail, the system can continue operation without interruption
- System Interconnect, called Quick Path Interconnect (QPI), provides multiple access routes. This ensures continued operation even if one route fails
- Fans, PCI Express switches, PCI Express cards, and Ethernet ports, are redundant
- HDD can be configured using hardware or software RAID
- Management Boards (MMB) and Power Supply Units (PSU) can be optionally configured as redundant

### Only grow as you need

With up to 120 cores and maximum 12TB of memory, PRIMEQUEST 2800E has the resources to accommodate hundreds of workloads. Performance has doubled ensuring PRIMEQUEST 2800E capability as an enterprise workload platform continues to expand This platform has 2.5 times the performance of predecessor model PRIMEQUEST 1800E2.

### Performance comparison of PRIMEQUEST 2800E, 2400E, and 1800E2



### Lower operational costs

PRIMEQUEST 2800E can reduce operational costs : power consumption, datacenter space, and Oracle license and support charges,

- This halves the power consumption charge compared to predecessor model PRIMEQUEST 1800E2 at the similar performance.
- This model can also reduce datacenter space from 12 to 10 rack units.
- Oracle database license and support charges are halved compared to predecessor model.
- According to Fujitsu's estimation, Oracle database license and support charges is much more lower in PRIMEQUEST 2800E compared to other vendor's UNIX highend servers at the similar performance

### Simplified server lifecycle management

During a server's life cycle you must undertake a variety of actions including installation, integration, monitoring, maintenance, and upgrading. To do this you have to use different tools for different actions. It can be a nightmare. Fully integrated tools through the lifecycle are what our customers are demanding.

Fujitsu provides an integrated suite of tools that take care of server products at your datacenter for the entire life of the server. ServerView Suite, a bundled product with PRIMEQUEST and PRIMERGY, can help ease the pain in dealing with servers. This includes:

- Automated OS installation on multiple servers
- Automated RAID configuration
- Automated driver updates, hot fixes and security patch applications
- Integrated monitoring of multiple PRIMEQUEST and PRIMERGY servers
- Simplified setup and monitoring of disk array controllers, HDD, and logical drives

The suite also enables early problem detection and resolution via intuitive diagnostics, look-and-feel operation and pro-active error alerts.

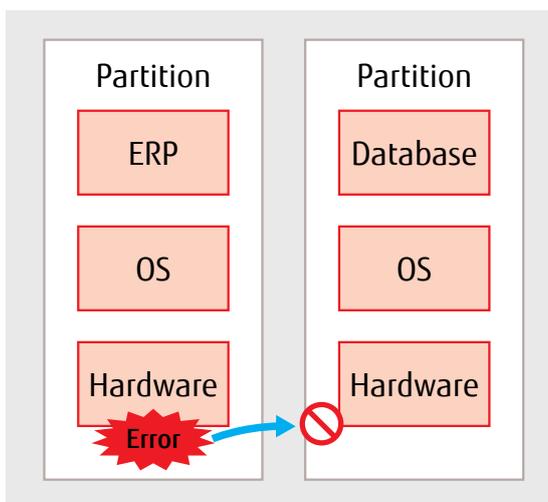
### Protect confidential data

PRIMEQUEST embeds security measures into its hardware and OS. Due to swift encryption by Advanced Encryption Standard New Instructions (AES-NI) with the Intel® Xeon® E7-8800 v2 product family, a hacker will not maliciously use any stolen data. As an example, Oracle Database 12 and Xeon® processors shrink the encryption time to one-tenth.

### Risk-free virtualization

Using PRIMEQUEST and industry standard virtualization, such as VMware vSphere™ 5, Hyper-V, and KVM lets you more easily create the right platform for your demands. It means, simple migration using Physical partitioning with no performance overheads. High reliability is guaranteed by Physical partitioning as failures in one partition can never spread to other partitions. With VMware vSphere™ 5, hundreds of virtual machines can be created on one server.

PRIMEQUEST Physical partitioning delivers risk-free and reliable virtualization. Such partitioning without performance overheads also requires no elaborate performance testing on your application environments. Further your main mission critical applications, such as databases, can be fully isolated from failures in all other partitions.



If you are planning to accommodate greater numbers of workloads, you can mix standard virtualization products with Physical Partitioning. Such state-of-the-art virtualization means applications can share system resources more flexibly, while main systems remain fully protected.

