Business continuity and cost-efficiency have become essential demands on IT platforms. Offering the best-blend of standard and high availability technologies, PRIMEQUEST is an open enterprise system platform that fully maximizes uptime and greatly lowers TCO. This whitepaper explains how business continuity can be maximized by the thorough data protection and fail-safe mechanisms in every PRIMEQUEST.

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PRIMEQUEST is a mission-critical server that supports up to eight Intel® Xeon® CPU chips and maximum 80 cores. By combining the cost efficiency of x86 servers and high availability of UNIX server, customers can build their solid business platform and achieve a high return on investment with PRIMEQUEST.

The intention of this whitepaper is to convince the reader that PRIMEQUEST can help you reduce operational costs without sacrificing the business demands for high availability and performance scalability. First, PRIMEQUEST can minimize planned and unplanned downtime because almost all the components are fully redundant and hot replaceable. Plus, the heart of the server – the CPUs and memory – is protected from failure by multi-level data protection mechanisms. Second, PRIMEQUEST has very good performance scalability up to a maximum 80 cores and 160 threads. Third, PRIMEQUEST can also help reduce your server operation and administration costs with a range of measures from Green IT to well-developed IT system support.

PRIMEQUEST is unique breed in mission critical servers in its combination of openness, high-quality engineering, scalability and high availability delivers best-in-class cost efficiency and operational stability, comparable to high-end UNIX servers. This whitepaper compares HP Superdome-2 with PRIMEQUEST looking at operational costs, Oracle DB support charges, and the costs of ensuring high availability.
Maximizing business uptime is an axiom of mission critical server. However, to sustain server operation, even during a system failure, all components must be redundant. Especially the essential parts of the server such as CPU, memory, and system bus, they must be especially assured as a failure of one of those components has the capability to cause an entire system shutdown. In addition maintenance operations such as component replacement, patch application, and testing, must be able to be executed while business applications continue to run, without interruption, or with the very minimum of downtime.

**IN BUILT HIGH AVAILABILITY CAN SLASH MISSION CRITICAL SERVER COSTS**

Building mission critical systems could sacrifice cost efficiency. This is valid if the server being used lacks overall reliability. While clustering is a possible and practical solution with such servers, the need to double or triple the server count will bring extra costs – worse there are hidden costs that are easily overlooked.

- In a multi-server cluster, maintenance costs will be more than doubled because administrators must apply the same patches to all servers in the cluster. They must also switch the cluster nodes before and after maintenance
- License and support charges for some software may also double
- Even clustered systems are not totally safe from server failure. So, business losses by such downtime must be contemplated. In a High Availability (HA) cluster, for example, if failed nodes are switched to a stand-by node on failure, the cluster switching process requires a number of minutes to restart applications. If cluster parallelism such as Oracle Real Application Clusters (RAC) is used, performance deterioration will be unavoidable. For instance here, with a dual node Oracle RAC system, the performance would be halved during the time the failed server was offline.

PRIMEQUEST on the other hand embeds the equivalent of high-end UNIX server availability in every unit; this means the operational costs related to high availability are as low as those of UNIX servers.

**CPU PROTECTION**

- Xeon 7500 processor series and E7-8800 processor series are designed to handle recoverable and unrecoverable errors
  - Recoverable errors
    - Both data and tag fields in cache levels 1/2/3 can detect and correct bit errors. The data protection features of level 3 cache are described below.
      - Data array
        - Up to three bit errors can be detected and retried. Up to two bit errors can be corrected.
      - Tag array, core valid array, and LRU (Least Recently Used)
        - Up to two bit errors can be detected and retried. One bit errors can be corrected.
  - Unrecoverable errors
    - If the above retry operations are successful, the application and operating system are not notified of the error. Only if the recovery is unsuccessful the application is stopped.

- Other data protection features
  - One-bit errors are handled by each processor's circuits: Registers, ALUs (Arithmetical and Logical Units), and TLBs. They can detect & correct such errors.

**MEMORY PROTECTION**

Memory chips and their interfaces to CPUs also have to be protected from errors. This is because memory is one of the most error-prone parts of the server and memory failures have the ability to cause an entire server stoppage.

- Multi-bit error recovery
  - Even with an error occurring in a DRAM module, the application can continue operating while the error is corrected.

  In DRAM 4-bit or 8-bit data chunks are typically assigned an additional DRAM bit. ECC (Error Check and Correct) uses this information to correct read errors so that CPU memory access can continue when an inconsistency is found.

  PRIMEQUEST 1800E2 with Xeon E7 product family processors is able to recover dual DRAM failures using Dual Data Device Correction (DDDC) (Figure 1). PRIMEQUEST 18000E with Xeon 75000 processor series is able to recover single DRAM failures using Single Device Data Correction.

- Memory Mirroring
  - Memory Mirror is a memory redundancy function that allows each CPU to write to and read from a memory pair. This means CPU-memory access can continue even if a whole DRAM module fails, as the other available DRAM module still contains the correct data.

  Memory Mirroring is capable of handling concurrent failures such as a memory chip and memory buffer failure. Both PRIMEQUEST 1800E and 1800E2 successfully continue memory access even when a memory chip or memory buffer failure occurs.

  While some of UNIX vendors argue their servers support memory mirroring, their memory buffers are not always a multiplex. This means their UNIX servers despite appearing to have memory mirroring may fail on a memory buffer failure.

- Guaranteed read/write operations
  - PRIMEQUEST 1800E and 1800E2 detect and correct one-bit errors, detect two-bit errors and then performs retry operations using ECC.

    If an error occurs on one SMI (Scalable Memory Interconnect) lane, which is an interface between processor and memory, memory access is able to continue using a spare lane.

- Memory Scrubbing
  - Memory Scrubbing means malfunctioned memory chip before it is used. This is designed to ensure early detection and correction of memory errors using ECC. This includes Demand Scrubbing error checking at memory read time, and periodic error checking by Patrol Scrubbing.
Due to one DRAM failure, one-bit is corrupted.

The corrupted bit is corrected by ECC.

Due to another DRAM failure, one-bit is corrupted.

The corrupted bit is corrected by ECC.

(4) Recovery of first DRAM failure
COMPONENT REDUNDANCY

The figure below shows that almost every component is redundant or can be used in multiplex configuration.

- Redundant components
  - Memory, PCI cards, standard LAN ports, fans, HDDs, service processors (ManageMent Board)
  - Path multiplex
  - Interconnections between System boards and PCI switches, CPUs and other System board components.

- In addition to CPU protection system boards can be protected from failure by use of a Reserved system board. This can be used for automatic replacement of the original board on failure.

HOT REPLACEMENT

All main components are hot-replaceable.

- Power supplies, fans, disk drives, PCI cards, service processors, and DVD drives
COMPARISON WITH HP SUPERDOME-2

Table 1 below compares HP Superdome-2 with PRIMEQUEST in terms of redundancy and hot replacement.

- **Redundancy**
  - PRIMEQUEST memory can be made redundant. But, HP Superdome-2 has no equivalent redundancy
  - PRIMEQUEST and HP Superdome-2 have the same level of redundancy for system interconnect and other components

- **Hot replacement**
  - PRIMEQUEST standard LAN ports, PCI cards, and DVD drives can be replaced during operation, but no corresponding statement can be found regarding HP Superdome-2

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>REDUNDANCY</th>
<th>HOT REPLACEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENTS</td>
<td>System Board (including CPU and memory)</td>
<td>System Board (including CPU and memory)</td>
</tr>
<tr>
<td></td>
<td>System Interconnect</td>
<td>System Interconnect</td>
</tr>
<tr>
<td></td>
<td>Other components</td>
<td>Other components</td>
</tr>
<tr>
<td>PRIMEQUEST</td>
<td>Memory can be redundant by Memory Mirroring</td>
<td>Cannot be replaced during operation</td>
</tr>
<tr>
<td>1800E/1800E2</td>
<td>Multiplex by Intel Quick Path Interconnect</td>
<td>Cannot be replaced during operation</td>
</tr>
<tr>
<td></td>
<td>Components below are redundant.</td>
<td>Components below can be replaced during operation</td>
</tr>
<tr>
<td></td>
<td>• PCI cards</td>
<td>• PCI cards</td>
</tr>
<tr>
<td></td>
<td>• Standard LAN ports</td>
<td>• Standard LAN ports</td>
</tr>
<tr>
<td></td>
<td>• FAN</td>
<td>• FAN</td>
</tr>
<tr>
<td></td>
<td>• PSU</td>
<td>• PSU</td>
</tr>
<tr>
<td></td>
<td>• Service processor (MMB)</td>
<td>• Service processor (MMB)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DVD drive</td>
</tr>
<tr>
<td>HP SUPERDOME-2 *1</td>
<td>No redundant components</td>
<td>Cannot be replaced during operation</td>
</tr>
<tr>
<td></td>
<td>Multiplex by Intel Quick Path Interconnect</td>
<td>Can be replaced during operation</td>
</tr>
<tr>
<td></td>
<td>Components below are redundant.</td>
<td>Components below can be replaced during operation.</td>
</tr>
<tr>
<td></td>
<td>• PCI cards</td>
<td>• FAN</td>
</tr>
<tr>
<td></td>
<td>• FAN</td>
<td>• PSU</td>
</tr>
<tr>
<td></td>
<td>• Service processor</td>
<td>• Service processor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Clock</td>
</tr>
</tbody>
</table>

*1 For HP Superdome-2 specification, see document below.  
Table 2 looks at processor and memory protection. As explained previously in this section, PRIMEQUEST 1800E and 1800E2 have multi-level protection for processor and memory. On the other hand, HP Superdome-2 does not support memory redundancy. For other memory and processor protection mechanisms, PRIMEQUEST and HP Superdome-2 have comparable functions.

### TABLE 2. PROCESSOR AND MEMORY PROTECTION OF PRIMEQUEST AND HP SUPERDOME-2

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>ITEMS</th>
<th>PRIMEQUEST 1800E/1800E2</th>
<th>HP SUPERDOME-2 *1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROCESSOR</td>
<td>Cache protection</td>
<td>Error detection and correction mechanisms for data and tag arrays.</td>
<td>Error detection and correction mechanisms for data and tag arraya.</td>
</tr>
<tr>
<td></td>
<td>Error check circuits</td>
<td>Register, ALU, and TLB equip with error detection and correction mechanisms.</td>
<td>Soft error hardened latches embedded</td>
</tr>
<tr>
<td>MEMORY</td>
<td>Multi-bit error recovery</td>
<td>Dual Data Device Correction supported *2.</td>
<td>Dual Data Device Correction supported.</td>
</tr>
<tr>
<td></td>
<td>Memory Mirroring</td>
<td>Supported.</td>
<td>Not supported.</td>
</tr>
<tr>
<td></td>
<td>Guaranteed memory read/write operation</td>
<td>Multiplex CPU-Memory lanes.</td>
<td>Multiplex CPU-Memory lanes.</td>
</tr>
<tr>
<td></td>
<td>Memory Scrubbing</td>
<td>Supported</td>
<td>Supported(Presumption )</td>
</tr>
</tbody>
</table>

*1 Documents below were used for this comparison

*2 This function is available for PRIMEQUEST 1800E2. PRIMEQUEST 1800E with Xeon 7500 series processors only supports Single Data Device Correction
In this section we discover the excellent cost-efficiency of PRIMEQUEST in mission critical operation. Further detailed analysis will be explained in the following sections.

**OPERATIONAL COST COMPARISON WITH HP SUPERDOME-2**

PRIMEQUEST 1800E2 has much lower operational costs than HP Superdome-2. The operational cost per year for a PRIMEQUEST 1800E2 with Windows server is more than $50,000 lower than that of HP Superdome-2. Configured as a Linux server, PRIMEQUEST 1800E2 has operational cost around $43,000 lower than that of HP Superdome-2.

But when it comes to Oracle database support charges, those charges for PRIMEQUEST 1800E2 are just half those of HP Superdome-2.

Assumptions in making these comparisons are as follows:

① Operational costs compared: administrative costs, server power consumption, and air conditioning costs

② PRIMEQUEST 1800E2 and HP Superdome-2 with the same numbers of cores have comparable performance

PRIMEQUEST 1800E2: Intel Xeon E7-8830 (8 cores) 8 CPU chips

HP Superdome-2: Intel Itanium 9350 4c (4 cores) 16 CPU chips

③ PRIMEQUEST 1800E2 and HP Superdome-2 have the same level of high availability

④ 24 hour, 365 days a year operation

⑤ Operating in the US

Figure 3 and Table 3 show operational costs per year excluding Oracle database support fees

- Operational costs for PRIMEQUEST 1800E2 Windows server is $20,000 lower than that of a Linux server PRIMEQUEST 1800E2 configuration
- Operational costs for PRIMEQUEST 1800E2 Windows server is $51,474 lower than that of HP Superdome-2
- Operational costs for PRIMEQUEST 1800E2 Linux server is $31,474 US$ lower than that of HP Superdome-2

---

**TABLE 3. TCO COMPARISON BETWEEN PRIMEQUEST AND HP SUPERDOME-2**

<table>
<thead>
<tr>
<th></th>
<th>PRIMEQUEST 1800E2 (Windows server)</th>
<th>PRIMEQUEST 1800E2 (Linux server)</th>
<th>HP Superdome-2 (HP-UX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM ADMINISTRATION</td>
<td>$328,000</td>
<td>$348,000</td>
<td>$372,000</td>
</tr>
<tr>
<td>POWER CONSUMPTION COSTS</td>
<td>$4,058</td>
<td>$4,058</td>
<td>$10,067</td>
</tr>
<tr>
<td>AIR CONDITIONING COSTS</td>
<td>$989</td>
<td>$989</td>
<td>$2,454</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$333,047</td>
<td>$353,047</td>
<td>$384,521</td>
</tr>
</tbody>
</table>

---

"Figure 3 and Table 3 show operational costs per year excluding Oracle database support fees"
Oracle Database Enterprise Edition 11g support fee per year

Figure 4 and Table 4 show Oracle support fees:
- PRIMEQUEST 1800E2 (64 cores): $304,000
- HP Superdome-2 (64 cores): $608,000

**TABLE 4. ORACLE DATABASE SUPPORT FEE**

<table>
<thead>
<tr>
<th></th>
<th>SUPPORT CHARGE FOR FIVE YEARS (US$)*1</th>
<th>CHARGE FOR ONE YEAR (US$)</th>
<th>FORMULA FOR FIVE SUPPORT CHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMEQUEST 1800E2 (64 cores)</td>
<td>$1,520,000</td>
<td>$304,000</td>
<td>64(number of cores) x $47,500 (fee per Oracle processor license) x 0.5 (Oracle multiplier)</td>
</tr>
<tr>
<td>HP Superdome-2 (64 cores)</td>
<td>$3,040,000</td>
<td>$608,000</td>
<td>64(number of cores) x $47,500 (fee per Oracle processor license) x 1.0 (Oracle multiplier)</td>
</tr>
</tbody>
</table>

*1 Relevant Service available for five years

This section explains why the selection of a standard OS such as Windows or Linux can slash administrative costs due to their wider familiarity. In this section, system administration costs are defined as labor costs for administrative work such as server monitoring for problem detection, OS configuration changes, and OS patch application.

In this comparison, the following is assumed:

1. Fujitsu PRIMEQUEST and HP Superdome-2 have comparable simplicity in server administration. PRIMEQUEST has a server administration Web interface comparable to HP Superdome-2 Online Administrator.

PRIMEQUEST also has an intuitive administration interface called ServerView Operation Manager.

2. Administration performed by four people covering 24 hours a day, 365 days a year operation.

Figure 5 and Table 5 show 24x7 operational administrator costs per year. 
- Costs for Windows server is $44,000 lower than that for HP-UX
- Costs for Linux server is $24,000 lower than that for HP-UX

<table>
<thead>
<tr>
<th>TABLE 5. SERVER ADMINISTRATION TCO COMPARISON</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ADMINISTRATOR YEAR (US$) PER YEAR PER</td>
</tr>
<tr>
<td>ANNUAL COST FOR FOUR PERSONS FOR 24 HOURS</td>
</tr>
<tr>
<td>OPERATION (US$)</td>
</tr>
<tr>
<td>PRIMEQUEST 1800E2 (Windows Server)</td>
</tr>
<tr>
<td>PRIMEQUEST 1800E2 (Linux Server)</td>
</tr>
<tr>
<td>HP Superdome-2 (HP-UX)</td>
</tr>
</tbody>
</table>

*1 These figures refer to job search site, www.indeed.com
http://www.indeed.com/salary?q1=Windows+Server+Administrator&l1=
http://www.indeed.com/salary?q1=Linux+Server+Administrator&l1=
http://www.indeed.com/salary?q1=HP-UX+Server+Administrator&l1=
Nobody is likely to argue against the tendency that server engineers are choosing Linux and Windows. While such tendency seems obvious, it is also worthwhile to confirm the growing dominance of these OS products and how UNIX demographics are changing. According to the National Salary Tendency statistics from www.indeed.com, HP-UX server administrator salaries in the US tend to be higher than those for Linux and Windows in 2009 and 2010 (Figure 6). It is therefore realistic to conclude that administrative costs for Linux and Windows servers will remain at a lower level than HP-UX in the coming years.

On the transition to a Linux and Windows server administrator population, Figure 7 shows the percentage job growth in the US market from January 2005. These graphs also refer to www.indeed.com.

1. Linux and Windows administrator job percentages grew until the end of January 2008, and then decreased during 2009. They started to grow again during 2010.

2. While HP-UX job percentages grew from 2005 to 2008, with ups and downs during the period. But from the beginning of 2009, the trend has been towards decline.

---

**Figure 6.**

**National Salary Trend from Indeed.com**

- Windows Server Administrator
- Linux Server Administrator
- HP-UX Server Administrator

**Figure 7.**

**Server Administration Job Percentage Transition in the US**

For Windows/Linux/HP-UX
There is an outstanding difference in the programmer job market. Job demands for Linux programmers grew by more than 50% from 2005 to 2010. On the other hand, job demand for HP-UX programmers declined by 75% from 2005 to 2010 (Figure 8).

The graphs below also refer to www.indeed.com

1. Linux programmer job percentage grew steadily from 2005 to 2010.
2. Windows programmer job percentages are flat overall during 2005 to 2007 while up and down on an annual basis, there was a decrease from 2008 until the end of 2009, with growth again in 2010.

As the programming population declines, companies using HP Superdome-2 servers will likely have to pay higher costs for application development. Worse still, application enhancement may become a major challenge with new application development becoming almost impossible in the future.

FIGURE 8.
PROGRAMMER SERVER ADMINISTRATION JOB PERCENTAGE TRANSITION IN THE US
For WINDOWS/LINUX/HP-UX
If you are managing a datacenter, slimming down server costs would be an urgent issue. Choosing unmatched servers may require facility reconstruction for additional power supply as well and additional floorspace.

But a cost-efficient server can reduce the risk of datacenter reconstruction. PRIMEQUEST consumes about 40% of the power used by HP Superdome-2. (Figure 9.) The comparison is based on maximum power consumption. But server power consumption and cooling costs are included in this comparison.

The maximum power consumption used in this comparison is because HP only discloses the maximum value for Superdome-2. While this maximum value represents the peak power consumption for the maximum configuration, such a large value is likely larger than you will observe in your datacenter.

### TABLE 6.
**SERVER RELATED POWER COST COMPARISON**

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>TOTAL POWER COST</th>
<th>Server Power Cost *1</th>
<th>AIR CONDITIONING COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMEQUEST 1800E2</td>
<td>$5,047</td>
<td>$4,058</td>
<td>$989</td>
</tr>
<tr>
<td>HP SUPERDOME-2</td>
<td>$12,522</td>
<td>$10,067</td>
<td>$2,455</td>
</tr>
</tbody>
</table>

*1 for calculation details, please see Tables 7 and 8.
PRIMEQUEST THE BEST COST-EFFICIENCY IN MISSION CRITICAL OPERATION

**Table 7. Power Consumption Cost Calculation**

<table>
<thead>
<tr>
<th></th>
<th>Max. Power Consumption (kW)</th>
<th>Annual Power Consumption (kWh)</th>
<th>Power Consumption Cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primequest 1800E2</strong></td>
<td>4.0</td>
<td>35,040</td>
<td>4,058</td>
</tr>
<tr>
<td><strong>HP Superdome-2</strong></td>
<td>9.924</td>
<td>86,934.24</td>
<td>10,067</td>
</tr>
</tbody>
</table>

**Formula**

\[ \text{Power Consumption Cost} = A \times 8760 \times 365 \times 24 \times \frac{11.58}{1000} \times 100 \]

*1* Electric fee per kWatt: 11.58 cents/kWh according to US Energy Information Administration

http://www.eia.doe.gov/emeu/steo/pub/contents.html

*2* Seasonal Energy Efficiency Ratio (SEER): 14 is set as ENERGY STAR qualified Central Air Conditioners must have a SEER of at least 14.

### Table 8. Air Conditioning Cost Comparison

<table>
<thead>
<tr>
<th></th>
<th>Server Power Consumption (kWh)</th>
<th>Server Power Consumption (BTU)</th>
<th>Air Conditioning Power Consumption (Wh)</th>
<th>Air Conditioning Power Consumption Cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primequest 1800E2</strong></td>
<td>35,040</td>
<td>119,626,560</td>
<td>8,544,754.286</td>
<td>989</td>
</tr>
<tr>
<td><strong>HP Superdome-2</strong></td>
<td>86,934.24</td>
<td>296,793,495.36</td>
<td>21,199,535.38</td>
<td>2455</td>
</tr>
</tbody>
</table>

**Formula**

\[ \begin{align*}
\text{Server Power Consumption (kWh)} & = A \\
\text{Server Power Consumption (BTU)} & = B \\
\text{Air Conditioning Power Consumption (Wh)} & = C \\
\text{Air Conditioning Power Consumption Cost (US$)} & = \left( \frac{A}{3414} \right) \times 11.58 \times \frac{1}{1000} \times 100
\end{align*} \]

*1* One HP Superdome-2 with 64 cores and two IO Expansion (IOX) cabinets.

This configuration is selected because Superdome-2 does not have PCI slots inside its cabinet – for making 16 PCI Express slots available, two IOX must be mounted. PRIMEQUEST 1800E2 has 16 PCI Express slots in the cabinet.

Respective power consumption is as follows.
- 8.82 kW for Superdome-2 cabinet
- 0.525 kW for IOX


*2* Cost per kWatt: 11.58 cents/kWh according to US Energy Information Administration

http://www.eia.doe.gov/emeu/steo/pub/contents.html

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*1* Conversion ratio from kWh to BTU is 3414

*2* Seasonal Energy Efficiency Ratio (SEER): 14 is set as ENERGY STAR qualified Central Air Conditioners must have a SEER of at least 14.
GREEN TECHNOLOGY INSIDE PRIMEQUEST

PRIMEQUEST’s energy efficiency is sustained by Fujitsu and Intel technologies.
- Intel's Intelligent Power Technology reduces power supply inline with CPU/Core utilization and memory use.
- The Integrated Power Gate can reduce power to idle cores to near-zero
- Low-Power State automation means processors and memory can be placed in their lowest available power state

Fujitsu smart power management technologies
- Multi-step Fan speed (Figure 10)
  Fan rotation changes smoothly matched to temperature changes. Efficient cooling means cool air is concentrated on hot spots like CPUs and memory. Heat radiation boards called Heat Sink are used with high heat generating components parts like CPUs. The large surface area ensures more efficient airflow use.
- System Board cooling (Figure 11)
  System Board design to concentrate cool air onto hot spots like CPUs and memory.
- Power Supply Unit (PSU) Efficiency (Figure 12)
  PRIMEQUEST PSU are highly energy efficient when converting AC-DC and DC-DC current.

**Figure 10.**
PRIMEQUEST MULTI-STEP FAN SPEED

**Figure 11.**
PRIMEQUEST SYSTEM BOARD COOLING

**Figure 12.**
PRIMEQUEST POWER SUPPLY EFFICIENCY
CONCLUSION

In every aspect of server TCO, whether it is administrative costs, power consumption costs, or Oracle support licenses, PRIMEQUEST is more cost-efficient than the equivalent HP Superdome-2. Equally important is the high availability compared to the UNIX server, as a result of all the redundancy and data protection mechanisms embedded at the heart of PRIMEQUEST. This makes PRIMEQUEST the right choice for mission critical server customers looking to increase their Return on Investment (ROI).

Some may argue that the cost-efficiency shown in this whitepaper may be valid in the US, but may not be valid elsewhere. Such are the differences in labor and power costs between developed and developing countries.

But while such costs do vary country by country, overall the cost of using PRIMEQUEST will always be lower than HP Superdome-2.

- PRIMEPOWER power consumption is just 40% that of Superdome-2. So, power costs will always be much lower with PRIMEQUEST.
- A sensible assumption is that Linux and Windows administrator populations are tending to grow in most countries and this tendency will push down corresponding labor costs. On the other hand, we can see no factor pushing down labor costs related to HP-UX
- Oracle Database support charges for PRIMEQUEST is half that of Superdome-2
- As for support charges per core, the ratio of Xeon and Itanium 9300 is 1 to 2. This ratio is common across all countries

The obvious conclusion therefore is that PRIMEQUEST will be able to offer outstanding cost-efficiency and high availability to customers worldwide.
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