

# Quantifying the Benefits of Consolidating Older HP-UX Environments to HP Integrity i4 Servers

**Detailed analyses of costs and benefits associated with consolidating older HP-UX environments to HP's new Integrity Systems Featuring the Intel Itanium 9500 Series Processor.**

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### Table of Contents

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#### Introduction

#### Math behind Server Consolidation

#### Scenarios Analyzed

#### The Finance of Consolidation

#### Data Collection Strategy

#### Respondent Profile

#### Customer-Reported Benefits from New Servers and OE

#### Itanium 9500 Consolidations are Very Green

#### Consolidation Scenario #1: Application Servers

#### Consolidation Scenario #2: Clustered Database Servers

#### Consolidation Scenario #3: Web Server Farm

#### Consolidation Scenario #4: Superdome 2

#### Conclusion

### Executive Summary

In November 2012 HP® announced five new servers based on the Intel® Itanium® Processor 9500 series (formerly known as "Poulson"). These new servers include the two-socket, 2U Integrity® rx2800 i4 rack mount server; three new Integrity blade servers (BL860c i4, BL870c i4, and BL890c i4); and the new Superdome 2 with CB900s i4 blades. Some of the key benefits these new i4 servers have compared to HP's Integrity i2 servers include faster performance, reduced energy use, expanded memory support, and improved RAS (Reliability, Availability, and Serviceability). Two key features contributing to the performance gains include doubling the number of processor cores from four to eight and increasing the processor's speed from 1.73GHz to 2.53GHz. Energy savings come from lower power requirements for the i4 chips (170 watts vs. 185 watts) and support for low voltage memory (1.35V vs. 1.5V). Improvements to multiple technologies help improve Integrity i4 servers' RAS. One notable improvement is the added support for electrically-isolated hard partitions (nPars) on Integrity i4 blades, a feature previously only available in Superdome 2 systems.

Four different consolidation scenarios were analyzed in detail from a financial perspective. The analyses are based on current pricing for new Integrity i4 servers with support as well as Support Plus contracts for out of warranty servers. The analyses also use customer-reported data about the operational characteristics of the servers.

The findings show that consolidations using Integrity i4 servers running HP-UX 11i v3 can pay for themselves relatively quickly. Three consolidation scenarios using Integrity i4 blades were analyzed: an 8:2 consolidation of HP 9000 rp4440-8 application servers, a 4:2 consolidation of clustered rx8640 database servers, and a 10:2 consolidation of BL870c web servers. These consolidations broke even after 3 months, 7 months, and 10 months respectively. The three-year cumulative savings were \$822,000, \$1.3 million, and \$377,000 respectively. The final scenario involved consolidating four Superdome 2-32s systems with Itanium 9350 i2 processors into two new Superdome 2-32s systems with Itanium 9560 i4 processors. This enterprise-class consolidation pays for itself after 1.8 years and generates cumulative savings of \$2.1 million after three years.

Server consolidation remains a top priority for many IT Managers. Companies running HP-UX environment could benefit greatly by consolidating older systems into Integrity i4 servers. The consolidations pay for themselves quickly and have the added benefit of improving availability, reducing energy use, saving floor/rack space, and enabling future expansion. After the consolidations pay for themselves, additional savings can be put towards other IT projects.

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### Highlights

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**In November 2012 HP introduced five new Integrity servers based on the 8-core Itanium Processor 9500.**

**In December 2012 HP shipped a new release of HP-UX 11i v3 that adds nPars support for the new Integrity i4 blades.**

### Introduction

HP® recently introduced five new Integrity servers based on the Intel® Itanium® Processor 9500 series (formerly known as "Poulson"). These new servers include the Integrity® rx2800 i4 rack mount server; the Integrity BL860c i4, BL870c i4, and BL890c i4 blade servers, and the new Superdome 2 with CB900s i4 blades. The most notable improvement over previous Integrity i2 servers is the increase in the number of processor cores from 4 to 8. This, combined with an increase in the maximum processor speed from 1.73GHz to 2.53GHz, means the new Integrity i4 servers offer more than 2x the performance per socket as comparable Integrity i2 servers. The Integrity i4 servers also offer reduced energy use, expanded memory support, and improved RAS (Reliability, Availability, and Serviceability). Energy use is reduced because the Itanium 9500 processors use less power than Itanium 9300 processors (170 watts vs. 185 watts) and the new servers support for low voltage memory (1.35V vs. 1.5V). Improvements to multiple technologies should improve Integrity i4 servers' RAS. One example is that electrically-isolated hard partitions (nPars), previously only available in Superdome 2 systems, are now available on Integrity i4 blades.

In addition to the hardware introductions noted above, HP introduced a new release of HP-UX 11i v3 (also known as v3) in December 2012. This is the eleventh update or release to HP-UX 11i v3 since it was first introduced in February 2007. The latest release adds nPars support on Integrity i4 blades and doubles the maximum size of an HP-UX workload to 256 cores. HP-UX 11i v3 is available in four different operating environments: Base OE (BOE), Virtual Server OE (VS-OE), High Availability OE (HA-OE), and Data Center OE (DC-OE). More information is available at <http://www.hp.com/go/hpux11i>.

Server consolidation has been a hot topic in the IT world for a number of years. According to a 2012 survey conducted by IDC, server consolidation and virtualization are currently the top priorities for chief information officers. The primary goal of server consolidation is to use computer server resources in a more efficient manner. This leads to a reduction in the total number of servers with a corresponding reduction in administration, support, energy, and facility costs. Virtualization technology, such as Integrity VM, is a key enabling technology for consolidation. Historically, data centers preferred to isolate applications by using a "one app/one server" model. This way, System Administrators didn't have to worry about compatibility issues between applications. The "one app/one server" model also meant that if one server was to crash for any reason, only one app would be affected. Virtualization makes it possible to run many applications on a single server, each in its own virtual environment separate from the others. One HP customer surveyed for this paper confirmed this benefit: ***“Before we had Integrity i2 servers, we had a 1 to 1 database to server ratio. With the improved performance of Integrity i2 servers and Integrity VM we are able to maintain 2 or 3 independent databases on a single server.”***

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### Highlights

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The new i4 servers and enhanced HP-UX create new opportunities for server consolidation.

Significantly faster processors and servers, combined with improved virtualization capabilities, make 4:1 or higher consolidation ratios feasible.

The vastly improved performance of the Integrity i4 servers, along with improvements to HP-UX virtualization technologies, appears to make these new servers ideal candidates for server consolidation projects. This paper provides in depth analyses into whether or not companies with HP-UX environments should consolidate these environments using HP Integrity i4 servers. Four different consolidation scenarios are examined in detail. In order to make this paper applicable to as broad an audience as possible, scenarios were designed to cover a broad range of servers including HP 9000, first generation Integrity blades, midrange servers with dual core Itanium processors, and a Superdome 2-32s system with quad-core “i2” processors.

### The Math behind Server Consolidation

As every server installation is unique, no paper can possibly address all possible scenarios. The amount of consolidation possible for an HP-UX 11i environment will depend on a variety of factors including the number of HP Integrity and/or HP 9000 servers, the applications they are running, the processing requirements of these applications, and the load and utilization factors of each server.

In the August 2007 paper entitled *The Benefits of Using HP Integrity Servers to Consolidate HP 9000 Servers*, TechWise Research explained in detail how it was possible to consolidate up to four midrange HP 9000 servers into a single midrange HP Integrity server. This 4:1 ratio was achievable due to the superior performance of Integrity servers and server virtualization. Following is a brief description of the math behind this 4:1 ratio. Integrity servers with dual core processors (circa 2007) offer approximately twice the performance of HP 9000 servers configured with the same number of CPUs. This facilitated a 2:1 consolidation ratio. In addition, HP’s virtualization technologies (specifically nPars, vPars, gWLM, Integrity Virtual Machine, and Secure Resource Partitions v2) made it possible for companies to use their dual core Integrity servers much more efficiently leading to a 50% reduction in CPU requirements. Combining the performance-related 2:1 server reduction with the virtualization-related 2:1 server reduction enabled companies to achieve as high as a 4:1 server reduction when consolidating multiple HP 9000 servers to dual core HP Integrity servers with vPars and gWLM or Integrity Virtual Machine.

One scenario in the 2007 paper involved consolidating 8 entry-level HP 9000 rp4410 servers into 4 HP Integrity BL860c blades. This consolidation results in no reduction in performance. The recently introduced BL860c i4 blade is two generations ahead of the BL860c blades in the above example and offers much faster performance. One scenario in this paper involves consolidating 8 HP 9000 servers into just two BL860c i4 blades.

## Scenarios Analyzed

As previously stated, this paper intentionally focuses on server consolidation projects as opposed to simple one-for-one system upgrades. The Integrity i4 systems were announced just six weeks before this paper's publication. It is too soon to know which consolidation scenarios are actually being implemented. TechWise Research asked HP to provide four consolidation scenarios it felt would be representative of those that will be implemented by customers. The tables below summarize these four consolidation scenarios.

## Highlights

This paper includes detailed analyses on four consolidation scenarios provided by HP.

#1: Original Environment	New Environment
<b>Eight HP9000 rp4440-8 servers:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v2 FOE</li> <li>• Each with 2 PA8900 1 GHz (2ch/4co) and 16GB RAM</li> <li>• Total: 32 cores, 128GB RAM</li> </ul>	<b>Two HP Integrity BL860 i4 blades:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v3 BOE</li> <li>• Each with 1 Itanium 9540 2.13 GHz (1ch/8co) and 64GB RAM</li> <li>• Total: 16 cores, 128GB RAM</li> </ul>

#2: Original Environment	New Environment
<b>Four HP Integrity rx8640 servers:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v3 HA-OE</li> <li>• Each with 16 Itanium 9150 1.60 GHz (16ch/32co) and 512GB RAM</li> <li>• Total: 128 cores, 2048GB RAM</li> </ul>	<b>Two HP Integrity BL890 i4 blades:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v3 HA-OE</li> <li>• Each with 6 Itanium 9560 2.53 GHz (6ch/48co) and 288GB RAM</li> <li>• Total: 96 cores, 576GB RAM</li> </ul>

#3: Original Environment	New Environment
<b>Ten HP Integrity BL870c blades:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v3 BOE</li> <li>• Each with 4 Itanium 9150N 1.6 GHz (4ch/8co) and 64GB RAM</li> <li>• Total: 80 cores, 640GB RAM</li> </ul>	<b>Two HP Integrity BL870 i4 blades:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v3 BOE</li> <li>• Each with 4 Itanium 9560 2.53 GHz (4ch/32co) and 256GB RAM</li> <li>• Total: 64 cores, 512GB RAM</li> </ul>

#4: Original Environment	New Environment
<b>Four HP Integrity Superdome 2 9350:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v3 DC-OE</li> <li>• Each with 32 Itanium 9350 1.73 GHz (32ch/128co) and 1024GB RAM</li> <li>• Total: 512 cores, 4096GB RAM</li> </ul>	<b>Two HP Integrity Superdome 2 9560:</b> <ul style="list-style-type: none"> <li>• HP-UX 11i v3 DC-OE</li> <li>• Each with 24 Itanium 9560 2.53 GHz (24ch/192co) and 2048GB RAM</li> <li>• Total: 384 cores, 4096GB RAM</li> </ul>

The following sections describe the study's analytical approach and data collection strategy.

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### Highlights

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Initial upfront costs for the consolidations are offset by ongoing savings in the TCU analysis.

### The Finance of Consolidation

The decision whether or not to consolidate an existing HP-UX server environment involves many factors. Since 1998, TechWise Research has been publishing reports on the financial aspect of these decisions. TechWise Research developed its Total Cost of Upgrade™ (TCU™) approach to help companies analyze potential upgrades and consolidations from a financial perspective. There are two sides to the equation used in this paper to quantify the TCU for consolidating HP-UX 11i environments to HP Integrity i4 servers running v3: initial upfront costs and potential ongoing savings.

#### Initial Upfront Costs

- **Integrity Servers:** The cost to purchase the Integrity servers configured as desired with three years of 24x7 customer support (the three years of support are paid for at the time of purchase).
- **HP Software:** The licensing costs for the HP-UX Integrity OE (this is zero for those under a support contract).
- **Installation:** The time and/or money spent installing the new Integrity servers.
- **Training:** The time and/or money spent learning to use the new server and related applications such as vPars, gWLM, or Integrity VM.

All of the above are one-time costs that are paid at the beginning of the consolidation project. TechWise Research contacted HP directly for the list prices of the servers and support contracts. A discount was applied to the list prices to more accurately reflect what companies would actually pay. Scenarios 1, 2, and 3 were discounted 20% while Scenario 4 was discounted 30%. A higher discount was used for the new Superdome 2 because they usually sell to large companies that purchase in greater volume. Installation and training costs were estimated based on previous surveys conducted by TechWise that quantified the average time and money companies spend to install and learn how to use a new server. There are several potential sources of ongoing cost savings that could offset these upfront costs.

#### Potential Ongoing Savings

- **Support Contracts:** The difference between the old environment's out-of-warranty support costs and the new environment's support.
- **Management Costs:** The difference in time and costs spent managing the old and new environments on an ongoing basis.
- **Availability Costs:** The difference in unplanned downtime between the old and new environments.
- **Energy Costs:** The difference in ongoing power and cooling costs between the old and new environments.

Third-party software license transfer fees are intentionally excluded from the analyses because every company is running a different mix of applications. Floor space savings are also excluded because extra space in downtown Manhattan is much more valuable than extra space in Omaha Nebraska.

## Data Collection Strategy

TechWise Research utilized current system and services pricing as well as customer data to perform TCU analyses on the four server consolidation scenarios. TechWise Research obtained current system and service pricing directly from HP. Few if any companies pay list price for servers. For this reason, as previously stated, list prices were discounted 20% in Scenarios 1, 2, and 3 and 30% in Scenario 4. This was done so the analysis would be based on realistic pricing. Post warranty service costs for the older environments were also obtained directly from HP.

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## Highlights

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**HP provided pricing for the new servers (hardware, software and support) and out of warranty support for the old servers.**

**Operational data for older Integrity and HP9000 servers come from previous TechWise Research surveys.**

**Operational data for Integrity i2 servers come from a recently completed survey of 79 IT professionals who manage these systems.**

**Integrity i2 operational data was also used for Integrity i4 servers because the i4 servers have not been available long enough to be studied directly.**

A key component of the TCU model is the operational costs of the servers being studied. Management and availability costs cannot easily be estimated from spec sheet data or industry experience. The best way to quantify management and availability costs is to survey System Administrators who work for companies that are using the target systems in a production environment.

TechWise Research previously conducted studies using the above approach that quantified the operational characteristics of HP 9000 servers and dual core Integrity servers running HP-UX. Findings from these studies were used in this paper for HP 9000 and dual-core Integrity servers. TechWise Research did not, however, have any operational data for Integrity i2 or Integrity i4 servers. As a result, a market research study was designed and implemented in the United States to collect operational data for Integrity i2 and i4 servers. The web survey targeted System Administrators and other IT professionals who are using HP Integrity i2 servers running HP-UX 11i v3. To qualify, the respondents had to be familiar with the operational characteristics of these servers. In addition, the Integrity i2 servers had to have been running in a production environment for at least 6 months. A total of 79 IT professionals participated in the survey.

It is far too soon to measure operational characteristics for Integrity i4 servers because these servers were just introduced. It will likely be late 2013 to early 2014 before there are enough companies to survey that will meet the criteria of having Integrity i4 servers running in production for six or more months. Rather than delay this paper 12-18 months, the operational data collected for Integrity i2 servers will also be used for Integrity i4 servers. TechWise Research has used this approach successfully in the past when studying servers that were recently released. This approach is conservative because it ignores any improvements in the Integrity i4 servers in terms of server management or availability.



## Respondent Profile

One of the design criteria for the study was to survey a random sample of US-based companies that are using HP Integrity i2 servers running HP-UX 11i v3. The following table shows that respondents came from companies ranging in size from small businesses all the way to very large corporations.

### Highlights

Two out of three respondents have four or more years of experience working with the HP-UX operating system.

Operational data was collected for 1,055 HP Integrity i2 servers running HP-UX 11i v3.

#### Number of Worldwide Employees at All Locations

Less than 100	3%	2,500 to 4,999	15%
100 to 499	14%	5,000 to 9,999	19%
500 to 999	11%	More than 10,000	28%
1,000 to 2,499	10%		

Overall, nearly half (47%) of the respondents work for large companies that have 5,000 or more employees worldwide. Respondents also represent a wide variety of industries. The top four industries include Medical/Healthcare, Finance/Accounting, Manufacturing, and Education.

The table below highlights all of the industries represented in the study.

#### Industry

Medical/Health Care	17%	Telecommunications	4%
Finance/ Accounting	13%	Aerospace	3%
Manufacturing	11%	Government – Federal	3%
Education	9%	Real Estate	3%
Architecture/ Engineering	6%	Government – State/ Local	1%
Insurance	6%	Legal	1%
Banking	5%	Online/ ISP	1%
Distribution / Retail	5%	Transportation / Shipping	1%
Research & Development	5%	Other	6%

Most respondents are very familiar with HP-UX. Sixty-five percent have personally worked with HP servers running HP-UX for at least four years.

The survey was designed so that respondents provided operational data only for HP Integrity i2 servers for which they were familiar. The 79 respondents in this study provided detailed operational data for a total of 1,055 Integrity i2 servers running HP-UX 11i v3.



## Customer-Reported Benefits from New Servers and OE

In addition to quantifying the operational characteristics of their Integrity i2 servers, respondents also made comments about their systems. Following are “Voice of the Customer” comments from two respondents regarding HP-UX 11i v3 advantages over older versions of HP-UX:

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### Highlights

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Survey respondents reported a number of benefits from HP-UX 11i v3 and their Integrity i2 servers, compared to older HP-UX systems.

*“More advanced functionality in [HP-UX 11i] v3 makes it easier and quicker to support and maintain. We estimate the time savings of using the new OS to be around 20%.”*

*“Hardware configuration is easier in v3 than in older versions of HP-UX. There is a more user-friendly management interface in the newer version.”*

Respondents also commented on the benefits they have seen from Integrity i2 servers compared to the older servers used in their HP-UX environments. Below are comments from five respondents:

*“Our Integrity i2 servers give us several benefits. We get much better performance with less hardware, more uptime and significant savings in power usage. We are also able to contain multiple environments within the same enclosure.”*

*“The new Integrity i2 servers are 5X faster than our old HP-UX servers. This impacts our service since our applications are running at increased speed. We have also seen less downtime.”*

*“There is less downtime with the Integrity i2 servers and there are fewer occurrences of the server failing. If the server does fail, it is quickly repaired.”*

*“The [Integrity i2] servers have tripled our processing power. They have also lowered our data center footprint for web services by 2/5 and have reduced electricity costs. Our team has saved a considerable amount of time with regard to firmware upgrades and downtime.”*

*“The Integrity i2 server is significantly faster (at least 40%) than our previous server. This increased performance has allowed our mission critical application to run more robustly and efficiently and at a lower overall cost.”*

## Itanium 9500 Consolidations are Very Green

For the past several years TechWise Research has included energy costs in our TCU analyses. From an IT perspective, reducing energy use provides two key benefits to system administrators. The first obvious benefit is the savings in the form of a smaller utility bill. The second and possibly more important benefit is the reduction in the amount of heat generated. Heat is perhaps the number one enemy of a server room. Excessive heat can lead to component failure and unplanned downtime. The more energy a server uses, the more heat it generates resulting in a need for a larger HVAC system to ensure the servers are operating within a safe temperature range.<sup>1</sup>

### Highlights

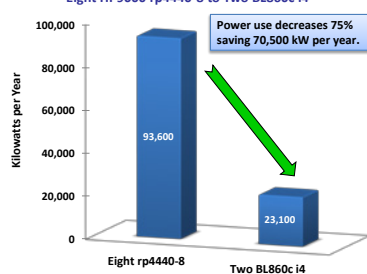
One effective strategy companies can use to save energy and “go green” is to consolidate older HP-UX servers into new Integrity i4 servers.

The four consolidation scenarios studied reduced energy use between 60% and 75%.

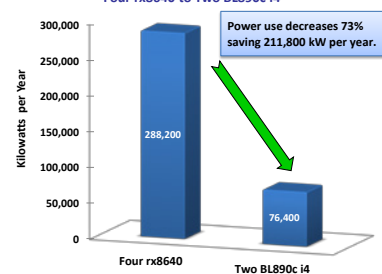
In addition to saving tens of thousands of dollars annually in energy costs, these consolidations reduce server room heat which is a leading threat to server hardware.

All four consolidation scenarios analyzed in this paper result in significant reduction in power and cooling requirements. The HP9000 rp4440-8 and Integrity rx8640 consolidations resulted in the greatest energy savings on a percentage basis. The charts below show how these consolidations reduce energy/cooling requirements by 75% and 73%, respectively.

Scenario #1: Change in Power Requirements  
Eight HP9000 rp4440-8 to Two BL860c i4

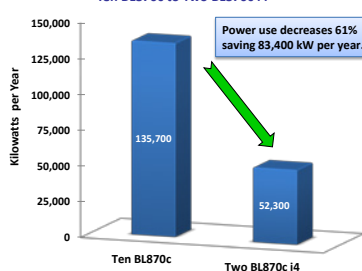


Scenario #2: Change in Power Requirements  
Four rx8640 to Two BL890c i4

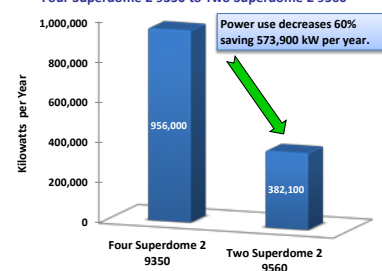


The BL870c and Superdome 2 9350 consolidations reduce energy/cooling requirements by 61% and 60%, respectively. Despite having the smallest percentage reduction, the Superdome 2 9350 consolidation would result in the greatest total savings. This consolidation would save over 570,000 kW annually which translates into \$70,000 in lower utility bills. It also reduces cooling requirements by 12,750 BTUs/hr or 1 ton of cooling.

Scenario #3: Change in Power Requirements  
Ten BL870c to Two BL870c i4



Scenario #4: Change in Power Requirements  
Four Superdome 2 9350 to Two Superdome 2 9560



These power savings were included in the TCU cash flow analyses.

<sup>1</sup> Heat from server blades tends to be more concentrated than heat from rack-mount servers. HP's c7000 enclosure configured with a sufficient number of cooling fans can handle the concentrated heat.

## Consolidation Scenario #1: Application Servers

In Scenario #1, eight identical HP 9000 rp4440-8 servers running HP-UX 11i v2 Foundation OE (FOE) are consolidated into two HP Integrity BL860c i4 blades running HP-UX 11i v3 Base OE (BOE). The acquisition price of the two BL860c i4 blades each configured with one Itanium 9540 2.13 GHz processor (1 chip/8 cores), 64GB of RAM and 600GB of internal storage is \$65,500. This price includes a HP642 rack, c7000 enclosure, three years of HP Support Plus service, and installation costs. There is no License to Use (LTU) cost for HP-UX 11i v3 BOE because it is assumed that the customer has a current support agreement with HP which effectively allows them to transfer their licenses to the BL860c i4 blades. The cost includes internal labor costs for installation.

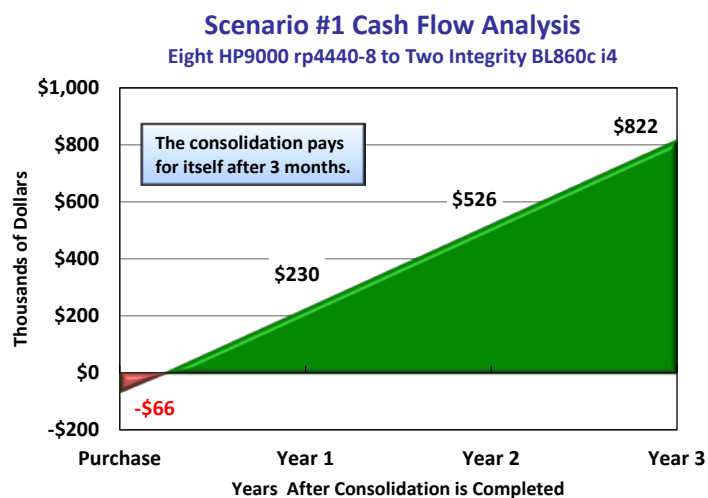
### Highlights

**This 8:2 consolidation project with HP Integrity BL860c i4 blades pays for itself in just 3 months. This is due to greatly reduced support costs and much improved reliability and manageability.**

**After three years, this consolidation results in cumulative savings of \$822,000.**

An HP Support Plus service contract on 8 rp4440-8 servers currently costs \$137,000 a year. These savings alone would pay for the consolidation in well under one year. Based on survey data, this consolidation will result in an annual savings of \$40,000 in management costs. Furthermore, the two new BL860c i4 blades will be much more reliable than the older rp4440-8 servers. Every company has a different cost associated with an hour of unplanned downtime. Past surveys have shown this rate ranges from thousands to millions of dollars per hour. In this scenario TechWise Research used an hourly cost for downtime of \$10,000 for these entry level application servers that are not running in a high availability environment. At this rate the consolidation will save \$150,000 a year in downtime costs.

When all factors are considered, a three year cash flow analysis results in the chart below. After three years this consolidation will result in cumulative savings of \$822,000. In addition, the consolidation pays for itself in just 3 months. This consolidation reduces energy use by 75%. Finally rack space requirements, although not in the TCU calculations, are reduced from 32U to 10U.



Note: rp4440-8 servers are often used as application servers. This Scenario was an 8:2 consolidation as opposed to 4:1 because few companies would consolidate all of their applications onto a single server.

## Highlights

**This 4:2 consolidation project with HP Integrity BL890c i4 blades pays for itself in just 7 months.**

**After three years, this consolidation results in cumulative savings of \$1.3 million.**

### Consolidation Scenario #2: Clustered Database Servers

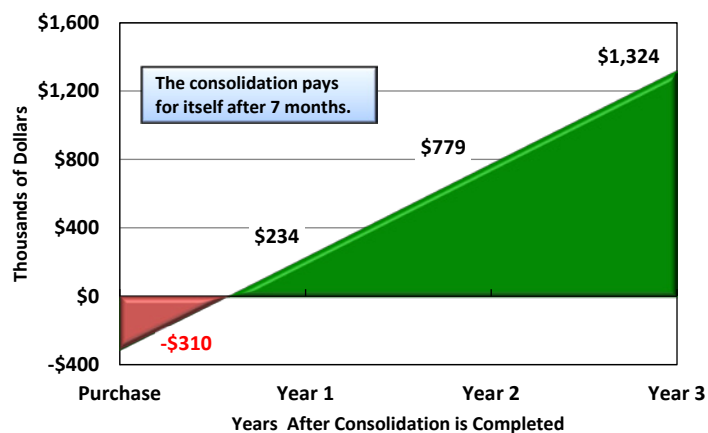
Scenario #2 involves consolidating four Integrity rx8640 midrange servers that are being used as database servers into two Integrity BL890c i4 blades. The four rx8640 servers each have 16 Itanium 9150 1.6GHz CPUs, are more than three years old, and are running HP-UX 11i v3 High Availability OE (HA-OE). Each BL890c i4 blade is configured with six 8-core Itanium 9560 2.53GHz CPUs, 288GB of RAM, and 600GB of internal storage. We assume that the rx8640 servers are covered by an HP Support Plus contract which entitles the customer to transfer their HA-OE licenses to the new blades at no cost. The acquisition cost of the two BL890c i4 blades including rack, enclosure, three years of support, and installation is \$310,000. This cost ignores any residual or trade-in value for the four rx8640 servers.

A Support Plus service contract for four rx8640 servers costs \$462,000 per year. As in Scenario #1, the savings in support costs alone will pay for the new Integrity i4 blades in less than a year. Based on survey data, companies can also expect reduced system management and downtime costs.

This scenario was analyzed using a higher hourly downtime cost rate of \$50,000 for two reasons. First, the rx8640 servers are being used as database servers which tend to have higher associated downtime costs. Second, these servers are running HP-UX 11i v3 High Availability OE as further evidence that downtime is costly. Despite applying a \$50,000 per hour cost of unplanned downtime, the annual savings in reduced downtime is relatively small. This is because HP-UX HA-OE is very effective in reducing downtime.

Below is the three-year cash flow chart for this scenario. When all factors are considered, this scenario breaks even after 7 months and results in cumulative cash flow savings of \$1.3 million. This consolidation reduces energy use by 73%, saving 212,000 kW each year.

**Scenario #2 Cash Flow Analysis**  
Four Integrity rx8640 to Two Integrity BL890c i4



This consolidation would save considerable floor and rack space. The original environment requires 68U in two racks vs. 10U in one rack for the BL890c i4s.

### Consolidation Scenario #3: Web Server Farm

In Scenario #3 a web server farm consisting of ten Integrity BL870c blades (first generation) running HP-UX 11i v3 Base OE (BOE) is consolidated into two Integrity BL870c i4 blades also running BOE. The ten BL870c blades each have 4 Itanium 9150N 1.6GHz dual-core processors and 64GB of RAM. The two BL870c i4 blades each have 4 Itanium 9560 2.53 GHz 8-core processors and 256GB of RAM. The acquisition cost for these two new BL870c i4 blades, three years of Support Plus, and installation is \$145,000. In this scenario a company would re-use the rack, enclosure, and switches from the original environment. There is no need to purchase this related hardware. TechWise chose to analyze the consolidation re-using the rack, enclosure, and switches since this is the most cost-effective approach.

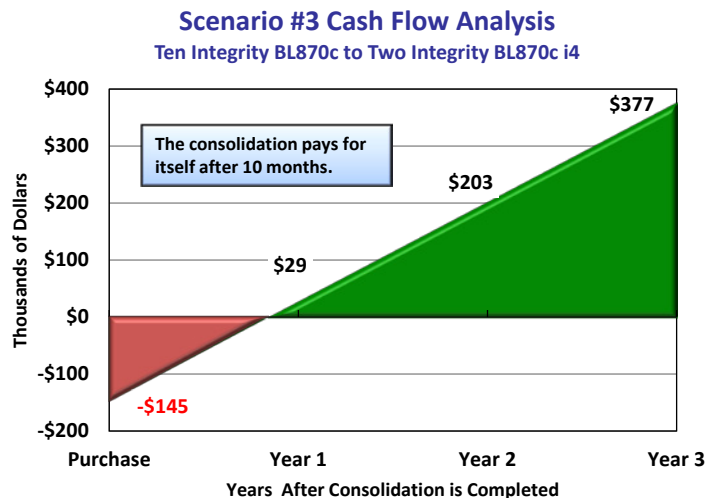
## Highlights

**This 10:2 consolidation project of a web server farm using HP Integrity BL870c i4 blades pays for itself in 10 months.**

**After three years, this consolidation results in cumulative savings of \$377,000.**

For this analysis each hour of downtime was assumed to cost \$25,000. Using this rate, the consolidation would result in \$95,000 of annual savings in reduced management and downtime costs.

Below is the three-year cash flow chart for this scenario. This consolidation pays for itself in 10 months. After three years this consolidation would produce cumulative savings of \$377,000.



It would cost an additional \$30,000 for a company to purchase a new rack, blade enclosure, and switches. This would increase the break-even point from 10 months to 12 months. This consolidation reduces rack space from 30U (three enclosures for ten BL870c blades) to 10U (for one enclosure). The new environment would also have room for two more BL870c i4 blades in the same enclosure. Finally, energy use is reduced 61% by consolidating ten BL870c blades into two BL870c i4 blades. This translates into 83,000 kW saved each year.

## Consolidation Scenario #4: Superdome 2

In this final scenario four Superdome 2-32s 9350 systems that are running HP-UX 11i v3 Data Center OE (DC-OE) are consolidated into two new Superdome 2-32s 9560 systems. Each of the original Superdome 2 systems has 32 Itanium 9350 1.73GHz CPUs (32 chips/128 cores) and 1024GB of RAM. Each of the new Superdome 2 systems has 24 Itanium 9560 2.53 GHz CPUs (24 chips/192 cores) and 2048GB of RAM. The new Superdome 2-32 system is HP's top-of-the-line enterprise-class HP-UX server. The acquisition cost of the two new Superdome 2-32s 9560 systems including racks, enclosures, installation, and three years of 24x7x4hr Support Plus is \$3 million.

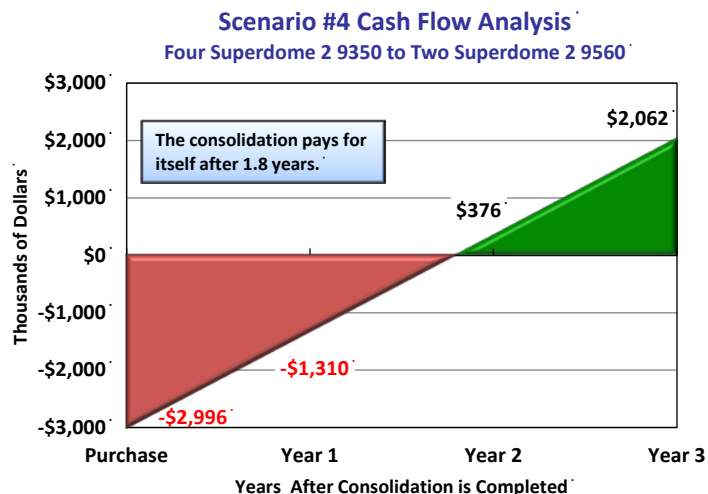
### Highlights

**This 4:2 consolidation project with new HP Integrity Superdome 2-32s 9560 pays for itself in 1.8 years. This is a very good payback considering that the customer pays \$1 million for three years of Support Plus upfront at the time of purchase.**

**After three years, this consolidation results in cumulative savings of \$2.1 million.**

The hourly cost of downtime was set to \$100,000 for this scenario. This high rate is justified because these are enterprise class systems running in "business critical" environments that cannot tolerate downtime. Despite this high cost of downtime, this consolidation will not result in significant downtime saving. The old and new environments are both extremely reliable. Combined with HP-UX 11i v3 DC-OE, the server hardware and operating environment's availability approaches "five nines" at 99.991%. From a TCU perspective, the new Superdome 2-32s 9560's slightly improved availability only becomes significant when hourly downtime costs approach \$1 million.

The real savings from this consolidation come from reduced support and system management costs. The annual current cost for a Support Plus contract for four Superdome 2-32s 9350 configured above is just under \$1.4 million. Consolidating 4 Superdome 2 systems into 2 new Superdome 2-32s systems will save just under \$200,000 a year in management costs. The three-year cash flow chart shown below indicates that this consolidation pays for itself in 1.8 years. After a three-year period this scenario would produce cumulative savings of \$2.1 million.



Finally, this consolidation reduces floor space requirements 50% (4 racks down to 2) and energy use by 60% resulting in 574,000 kW saved per year.



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### Highlights

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**Server consolidation with Integrity i4 servers pay for themselves quickly and provide room for future expansion.**

**Break-even points are one year or less for non-enterprise systems, and under two years for enterprise-class Superdome systems.**

### Conclusion

This study focused on quantifying the costs and benefits associated with consolidating older HP-UX environments into HP's just released Integrity i4 servers. Detailed cash flow analyses were performed on four consolidation scenarios. A variety of factors were included in the TCU analyses including: the list price of the new Integrity i4 systems with service contracts, current pricing for out-of-warranty Support Plus contracts for Integrity and HP 9000 systems, installation costs, management savings, energy savings, and downtime savings.

A total of 79 System Administrators were surveyed to collect operational data for HP Integrity i2 servers. These respondents reported data on 1,055 Integrity i2 servers running HP-UX 11i v3. Operational data for older Integrity and HP 9000 servers come from previous surveys.

Consolidations using Integrity i4 servers running HP-UX 11i v3 can pay for themselves relatively quickly. Three consolidation scenarios with Integrity i4 blades were analyzed: an 8:2 consolidation of HP 9000 rp4440-8 application servers, a 4:2 consolidation of rx8640 clustered database servers, and a 10:2 consolidation of BL870c web servers. These three consolidations broke even after 3 months, 7 months, and 10 months respectively. The three-year cumulative savings were \$822,000, \$1.3 million, and \$377,000 respectively.

The final scenario consolidated four Superdome 2-32s systems with Itanium 9350 i2 processors into two new Superdome 2-32s systems with Itanium 9560 i4 processors. A Support Plus contract on the four original systems costs \$1.4 million per year. The street price for the two new Superdome 2-32s systems is \$3 million. This consolidation breaks even in 1.8 years and saves \$2.1 million after three years. Most of the savings come from reduced support contract and system management costs. Downtime savings are relatively small because the original Superdome 2 is a highly reliable system.

All four consolidations reduce energy use between 60% and 75%. The Superdome 2 consolidation would save 574,000 kW of energy annually. The reduced energy use has the added benefit of reducing the cooling requirements of the system. Excessive heat is perhaps the number one threat to server hardware. It is true that blades generate their heat in a smaller space. Configuring the c7000 enclosure with sufficient fans will dissipate this heat and keep the i4 blades cool.

One customer gave the following overall comments regarding their Integrity i2 servers. ***"We are very satisfied with our Integrity i2 servers. They have high uptime, having very little unscheduled down time. Performance is solid and stable; they run everything we've put on them and the performance compared to our older HP-UX systems is much improved."*** It would not be surprising if a year from now companies make similar comments regarding the Integrity i4.



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