

The Business Value of HP-UX 11i

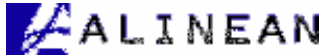
HP-UX 11i on Integrity Servers vs. IBM AIX 5L on eServer

*Lower TCO and higher ROI through superior virtualization,
scalability, availability, and intelligent manageability*

www.alinean.com

***Analyst: Thomas Pisello, author of IT Value Chain
Management: Maximizing the ROI from IT Investments
(Alinean Press – 2004)***

February 2006



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Alinean Inc. • 201 S. Orange Avenue • Suite 1210 • Orlando, FL 32801 USA

Tel: 407-382-0005 • Fax: 407-382-0906 • Email: info@alinean.com • Web: www.alinean.com

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Introduction

With the current focus on fiscal responsibility and due diligence, CIOs and IT executives have indicated that more than 80% of current IT purchases require financial analysis for justification.¹ This white paper is designed to provide the initial basis for exploring the financial advantages of HP-UX 11i versus other platform alternatives, and empower organizations to consider all costs and benefits to help make better investment decisions. Utilizing TCO allows the decision makers to look beyond just the initial purchase price of the hardware and software assets, which historically accounts for less than 30% of owning and operating typical server solutions over a 5-year period. TCO analysis can help IT make better business decisions by considering the total lifecycle costs and business benefits of a proposed solution. The analysis can be used by IT decision makers to provide guidance and awareness into the factors that contribute to HP-UX 11i and HP Integrity servers being the platform of choice in various project scenarios and competitive situations.

HP-UX 11i running on HP Integrity servers provides substantially more benefits in business critical computing environments and is able to deliver TCO savings of more than 15% compared to IBM AIX 5L on eServer p5 570 servers.

Organizations continue to look for more ways to make each dollar of computing investment go further, driving the continued need for application and server consolidation, reduced management costs, and better availability. On average, over 65% of existing IT budgets are spent on sustaining the existing computing infrastructure, burdened by ongoing IT operations, management, and maintenance costs, while migrations and upgrades consume 25%

annually. According to Alinean ROIT™ research, only 10% of IT budgets are currently targeted toward innovation and new functions. Reducing data center infrastructure costs can generate substantial savings opportunities for most IT organizations, allowing for fewer investments in computing infrastructure and more on innovation that supports key business strategies and growth initiatives – by creating a more agile and flexible IT infrastructure (or Mission Critical IT infrastructure).

Today there are many choices of server operating systems and platforms for transaction processing, enterprise applications, and large corporate database applications. All of the operating systems and hardware solutions have been designed with features to help meet the challenges of lowering costs and increasing flexibility. However, each configuration has different costs of ownership and business value, making it increasingly important to analyze in detail the various options, features, costs, and benefits.

This paper analyzes the five year lifecycle TCO of two alternative platforms, considering the costs to plan, purchase, implement, manage, and use two comparable UNIX server configurations for a specified scenario, application, and workload. The comparisons in this study use HP-UX 11i, a UNIX solution hosted on an open system platform using HP Integrity (Intel Itanium based) servers versus IBM AIX 5L running on proprietary RISC-based IBM eServers and quantifies how open systems UNIX solutions running on Intel Itanium servers can deliver higher levels of manageability, consolidation, virtualization, adaptability, security, and availability. As a result, HP-UX 11i running on HP Integrity servers provides substantially more benefits in business critical computing environments and is able to deliver total cost of ownership (TCO) savings of more than 15% compared to IBM AIX 5L on eServer p5 570 servers.

A customer case study scenario was developed for migration of a set of mission critical supply chain management applications from Tru64 UNIX® to a comparative HP or IBM solution. The analysis used competitive platforms, databases, services, available features, and practices to perform as close to a like-to-like comparison as possible. The analysis was complete in its accounting of costs and benefits, considering all direct costs of migrating from the legacy Tru64 UNIX® platform to the proposed HP or IBM solution. Because the solutions are business mission critical, the analysis also considered the indirect ownership costs and business benefit advantages of each solution, comparing downtime costs, security risks, time to market, and business agility.

By examining the TCO and ROI of various installations and scenarios, HP-UX 11i and Integrity servers have been found to significantly help companies reduce the cost of migrations and upgrades, reduce ongoing operations management and maintenance, improve availability, and increase adaptability for business critical computing.

¹ ComputerWorld - 2005

The Bottom Line – HP-UX 11i on HP Integrity vs. IBM AIX 5L on IBM eServer

When hosting, migrating or consolidating UNIX applications, a proprietary RISC-based UNIX platform such as IBM AIX 5L eServers typically has a higher five year total cost of ownership than comparable non-proprietary open UNIX solutions such as HP-UX 11i with HP Integrity server (Itanium® based) deployments.

Based on the migration and, operating scenario, and re-hosting requirements in this study, HP-UX 11i resulted in a 15% comparative TCO advantage over comparable IBM AIX deployment over a 5 year lifecycle. The benefits are a result of HP's solution focus on three key initiatives to collectively enable an enterprise to progressively become more agile:

- 1) IT standardization on open systems that reduces complexity through the use of fewer hardware and software components
- 2) Virtualization that allows the movement and balancing of workloads to the most available compute resources
- 3) Simplified and integrated management that allows alignment of IT resources with both real-time requirements and ever-changing business strategies

When deployed, these HP initiatives and product enhancements result in significant cost savings and business benefits when compared to the alternative proprietary IBM AIX eServer solution. The calculations for the comparison were performed using comparable project scenarios for a \$1 billion annual revenue US manufacturing company considering migrating a portfolio of eight supply chain management applications and database from Tru64 UNIX® AlphaServers running an Oracle database to an HP solution (HP-UX 11i, Integrity server, and Oracle) or an IBM solution (IBM AIX 5L, eServer, and DB2). Virtual server technologies are employed based on the capabilities of each operating system. The cost savings and business benefits of the HP solution compared to the IBM solution include:

- 85% lower change costs with special transition programs for Tru64 UNIX® clients
- 73% higher availability advantages
- 36% time to solution savings and accelerated application benefits
- 4.5% reduced IT operations management and support costs
- at least a 2% security risk mitigation advantage
- \$69,231 in annual incremental margin from business agility benefits

The cost savings with HP include lower change costs, higher availability advantages, and reduced support costs.

Additional business benefits include better adaptability and business agility.

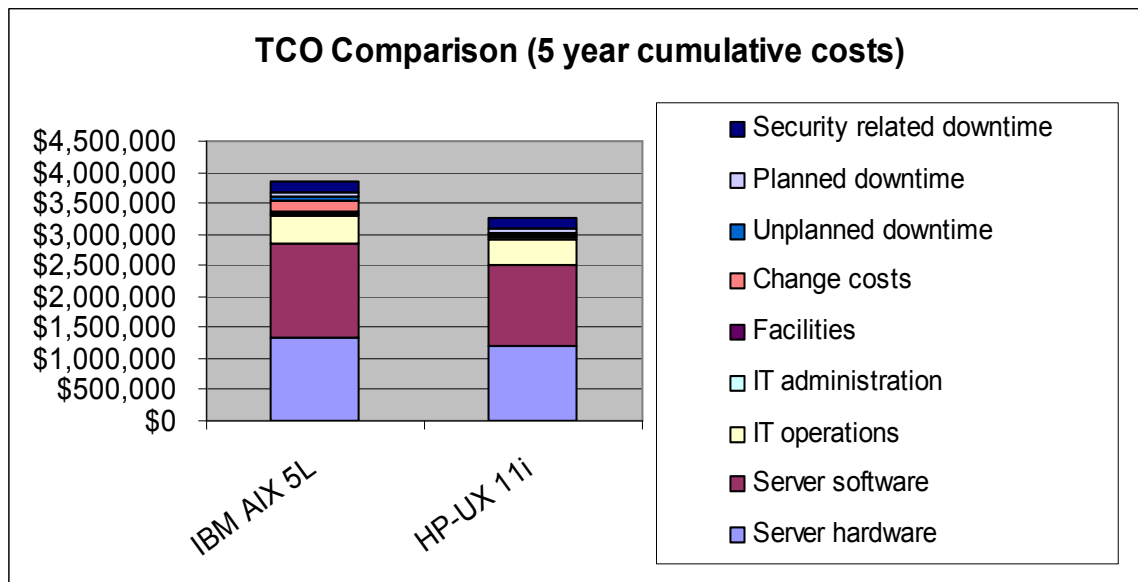
As well as the tangible cost savings from this case study, HP Integrity servers offer additional adaptability and business agility benefits which are harder to quantify, but significant. The adaptability benefits include the flexibility of running and consolidating multiple operating systems and applications on a single platform that can adapt to changing business requirements, the ability to perform field upgrades to the latest processors on older hardware, and doubling the computing power in-line or adding computing capacity with various on-demand service offerings. Taking advantage of

these adaptability benefits means that not only can HP lower the costs to the business today – but provide increasing value in the future. The business agility benefits include reducing the time to solution and the time required to perform application upgrades. By reducing the time to deploy a solution from 16 weeks with the IBM solution, to 10.3 weeks with the HP solution, an additional savings of \$493,267 is provided – a 36% savings over IBM. With improved agility, application upgrades can be accomplished more efficiently, providing HP with a 5% benefit over IBM. With these features, the HP Integrity server running HP-UX 11i is typically a more flexible mission critical server when compared to a more proprietary RISC-based solution.

To quantify and compare the costs and business value between platforms, the analysis modeled the cash flows of investments and benefits to determine which solution provided the lowest total cost of ownership over a five year lifecycle. For this analysis, a scenario was established for particular applications, OS, and system upgrade, with specific configuration plans and benefit opportunities. Assumptions were applied

such as the type of business and its location, best practices (people, process, and technologies), application requirements, platforms, configurations, costs, and any discounts, in order to arrive at results which could be applied easily to the specific alternatives. The summary of the results are presented in the table below.

TCO Comparison (5 year cumulative costs)	IBM AIX 5L	HP-UX 11i	Savings with HP-UX 11i	Savings with HP-UX 11i
IT Costs				
Direct Costs				
Server Hardware	\$1,344,350	\$1,200,375	\$143,975	10.7%
Server Software	\$1,508,168	\$1,294,356	\$213,812	14.2%
IT Operations	\$451,540	\$431,255	\$20,285	4.5%
IT Administration	\$13,080	\$13,080	\$0	0.0%
Facilities	\$34,025	\$37,955	(\$3,930)	-11.6%
Change Costs	\$197,246	\$29,659	\$167,587	85.0%
Total IT Costs	\$3,548,409	\$3,006,680	\$541,729	15.3%
Business Operating Costs				
Indirect Costs				
Unplanned Downtime	\$70,755	\$19,165	\$51,590	72.9%
Planned Downtime	\$61,170	\$61,170	\$0	0.0%
Security Related Downtime	\$170,255	\$167,305	\$2,950	1.7%
Total Business Operating Costs	\$302,180	\$247,640	\$54,540	18.0%
Total	\$3,850,589	\$3,254,320	\$596,269	15.5%



Summary TCO Analysis

TCO Analysis Methodology

To develop the comparisons, TCO and ROI models were developed by Alinean. Alinean applied IT spending and TCO benchmarks for over 30 different industries and over 20,000 companies to compile default data and metrics. This baseline information was then used to model typical data center strategies and best practices of the various server and operating system solutions.

All calculations were performed in US dollars, utilizing burdened labor rates for the defined industry and US suburban locations. Metrics for the hardware and software costs were gathered from Ideas International, Inc. or publicly available list pricing from corporate websites for HP and competitive solutions. The TCO metrics for all sections were validated as of September, 2005. A representation of street pricing was used in the analysis by utilizing list price benchmarks for all prices, and then applying a discount of 40% to all server and software purchases. Actual discounts may vary by customer and manufacturer.

This white paper represents an analysis that was performed at a specific time, with a specific application and user scenario, available systems and specific current cost structure and opportunity. The TCO is highly dependent on:

- 1) The point in time when hardware and software costs were examined. System specifications, pricing, and software licensing pricing and schemas change often.
- 2) The point in time when the other TCO metrics for labor, facilities, and downtime were examined because business cost structures, opportunities, and solution impacts vary as well over time.
- 3) The specific project scenario that the analysis was established for. This is highly dependent on application type, industry, users and workload, current system and application configurations and performance, selected features and practices, and current IT capability and maturity.

To see how a different scenario will compare using other configurations or particular discount rates, the information can be modeled in the HP ROI Analyst - Enterprise modeling tool (developed by Alinean, Inc.), which provides for specific TCO and ROI analysis of personal application, systems, costs, and benefits. To provide the latest information, the systems, costs, and metrics are updated in the HP ROI Analyst - Enterprise on a quarterly basis.

TCO Categories

To provide for a consistent comparison of data center server investment options, Total Cost of Ownership (TCO) categories are used to collect and compare cost of ownership metrics. The TCO categories are organized as follows:

TCO Chart of Accounts Category	Description
Hardware	Initial purchase price of servers, storage, networking devices, spares, and associated hardware maintenance and support contracts. Ongoing hardware investments to handle annual expenditures and workload / user growth.
Software	Initial non-recurring and ongoing annual software licensing costs including operating system, applications, middleware, database, systems management, and software support and maintenance contracts.
IT Operations	The labor or labor equivalents (outsourced / contract labor) cost for running the data center operations for servers and storage systems. Tasks include: service desk, performance and availability management, user administration, OS support, break-fix management, software

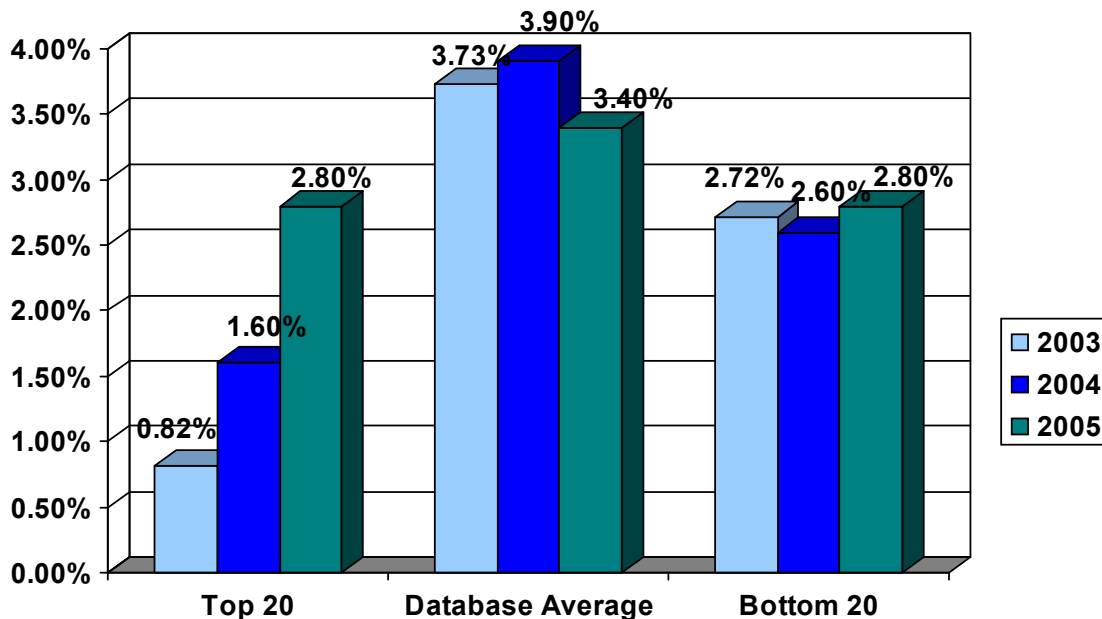
	deployment, application management (provisioning and scheduling), systems management, disk and file management, storage management, security management, and database management and administration.
IT Administration	The labor or labor-equivalent (outsourced / contract labor) costs for management and overhead tasks in running the data center including: vendor management, procurement, asset management, IT finance and chargeback, IT training, and user training and course development.
Facilities	Costs for data center floor-space, power consumption, and HVAC / cooling.
Change Costs (Upgrade Labor and Services)	<p>The labor cost, services, and application migration / porting to transition the servers from legacy installation to new configurations, including new server installations and applications and databases porting and migration.</p> <p>These costs include: installation, training, testing, data conversion and migration, systems setup and installation, porting or recompiling applications, loading OS, loading applications, and de-installation and retirement of existing assets.</p> <p>Where the manufacturer includes credits for transition programs, and these are publicly know, these credits are included.</p>
Availability	<p>Availability measures the time systems are up and available for computing. Non-availability is measured in unplanned downtime, and the business or productivity losses associated with system unavailability. The cost for downtime is measured as lost productivity for applications which support user functions, and lost business value and revenue for applications which support business transactions and key processes.</p> <p>Availability is measured in three ways:</p> <ul style="list-style-type: none"> • Planned downtime – outages caused by taking systems down for regular maintenance and upgrades. • Unplanned downtime – outages from hardware and software failures, data-loss, human errors, capacity issues, accessibility issues, and unacceptable response issues. • Security issues – a particular unplanned downtime caused by outages from security related issues such as virus, worm and Trojan attacks, denial of service, network intrusions, and data destruction events. Information losses such as the theft of trade secrets, credit information, and other business confidential information are not accounted for here. Business disruption insurance which may cover these acts is a cost of doing business and not an IT cost.
Strategic Business Benefits	Strategic business benefits are those which drive additional revenue or non-tactical improvements, including agility, flexibility, and adaptability to handle changing business demands and requirements. This includes the ability for the solutions to gain such advantages from standard, open system – non proprietary technology, future-proofing investments from change, avoiding future asset or labor costs because the existing system can adapt and absorb change quickly without additional investment, and time to solution deployment advantages for delivering adds, moves, and changes more quickly.

HP-UX 11i Strategic Benefits: Adaptability yields higher ROIT™

In Alinean IT spending and performance studies from 2001 to 2005, companies that were more agile proved to be the best performers, those achieving the highest ROIT™ (Economic Value Add / IT Spending).

The companies with superior EVA performance, Stern Stewart and Co.'s metric for improved shareholder value, calculated as net profit – cost of capital (assets – liabilities), are increasing their spending at twice the rate compared to the bottom performers, and 50% higher than the average company. Looking back to the slowdown in the year 2001, those who saw rough times approaching were better able to scale down expenditures early. The metrics indicate that those which recognized economic recoveries early and were able to prudently scale their IT operations and investments to meet the opportunities of the next wave were the winners.

IT Spending as a % of Revenue vs. Profitability Performance



EVA Performance Summary

Agility is not based on selecting the system with the lowest initial capital cost, as ongoing operating costs can easily and quickly exceed the initial savings. Similarly, selecting the lowest cost of ownership solution may not always be the superior choice in maximizing the business value of the investment. Based on the importance of managing IT for agility in order to gain higher success, selecting the most flexible solution allows the organization to reposition assets to better handle changing platform, operating system and application needs, workloads, growth, market opportunities, customer and partner needs, and mergers and acquisitions.

The value of an adaptive enterprise is quantifiably supported by the overall Alinean ROIT analysis, but is more difficult to quantify for individual investment decisions when compared to performing a TCO analysis. Here are some possible considerations for calculating the value of a superior adaptable enterprise investment:

Value of Adaptable Enterprise	Quantification	The HP Adaptive Enterprise Advantage
Lower change and growth costs	<p>Often over the useful life of a server platform, the user or application requirements change.</p> <p>This change can lead to a need to upgrade the server to increase computing capacity, or the need to repurpose the server for another application or operating system.</p> <p>Migrations or upgrades can require recompilation or porting of applications, which often requires skilled and costly labor resources.</p> <p>An adaptable system is able to handle multiple business requirements, be intelligently and flexibly repurposed or allocated, and more cost effectively scaled than the competition.</p>	<p>With HP-UX 11i porting or recompilation is typically not needed when transitioning from legacy applications or operating systems, avoiding costly change costs.</p> <p>With HP Integrity servers, computing capacity can almost be doubled by upgrading using mx2 processors. For example, a 64 processor computer can be converted to be 128 processors with the mx2 upgrade. The organization can avoid purchasing additional capacity upfront, or adding additional servers later to meet growth demands – increasing the asset count and ongoing management costs proportionately.</p> <p>With HP Integrity servers, multiple OS types are supported, and can be hosted simultaneously. Labor and time to change the platform, or partition support for the changing business demand is lower than the competition. With Identity Management now enforced by HP-UX, secure authorizations and single-stroke role-based modifications of users increase agility and security.</p> <p>Moreover, using partitions, and security containment for application isolation and compartment inter-processing, the application demands and other business rules can drive scheduling and computing power allocation dynamically to optimize asset usage and reduce costs.</p> <p>HP on-demand options such as capacity and instant capacity on demand can also be utilized to flexibly upgrade system processing power when needed, leading to better asset utilization and lower upgrade labor costs.</p>
Faster time to solution	<p>Lower change costs and flexible growth options can lead to a reduction in how much time it takes for the solution to be initially deployed, and how long it takes to respond to change requests.</p>	<p>HP-UX 11i with virtualization requires fewer physical assets than competitive solutions on average. This helps to reduce costly server procurement, setup, and deployment time.</p>

	<p>Each week the application is in development, the productivity or business benefits cannot be realized. Reducing the time to solution versus competitive solution delivering accelerated value to the organization.</p> <p>As business needs change and require platform changes, upgrades, or optimization, making these changes faster again leads to realizing the additional productivity and business benefits of the solution.</p>	<p>HP-UX 11i does not require most applications to be recompiled or ported, leading to reduced time to solution.</p> <p>As changes and upgrades are needed, virtualization, mx2 processor upgrades, and on-demand capacity options help lower time to solution.</p>
Business agility	<p>Being able to respond quicker to changing business needs not only delivers faster time to solution, but can deliver permanent and significant increases in incremental revenue opportunities. Normally there are small market windows to absorb an acquired business, launch a new product, new feature, or business process.</p>	<p>HP-UX 11i has the lowest change labor and time to deploy requirements when compared to competitive solutions.</p> <p>For ongoing capacity improvements or platform changes, options such as mx2 processors, virtualization and capacity on-demand can all help to deliver faster time to solution, enabling the company to realize additional revenue opportunities from being more agile and responsive than the competition.</p>

More about HP's approach to server virtualization

HP-UX 11i has a unique approach to virtualization, where partitioning is only a subsection of the whole story that leads to greater server consolidation.

In the HP Virtual Server Environment (VSE), administrators set up a pool of virtual resources, including partitions, which workloads can draw upon when required. This allows multiple applications with changing resource requirements to be accommodated within a single environment. HP's servers have the ability to deliver massive resources, and can scale to over one hundred processors and a terabyte of memory, thus creating some of the largest virtualized environments in the industry. The resource management capabilities in VSE can then be used to automatically allocate these resources to different workloads as they are needed in response to changing conditions.

At the heart of VSE are HP's industry-leading HP-UX 11i resource management software tools. HP's Process Resource Manager (PRM) was one of the first resource management functions to become available for UNIX systems. HP's PRM allows system administrators to set policies for how the system will allocate processor, real memory, and I/O resources to users, groups of users, and applications. In addition, HP offers a goal-based workload management tool called HP-UX Workload Manager (HP-UX WLM), which allows administrators to specify service levels based on application behavior, rather than simply specifying static allocations of resources to applications. Goal-based resource managers start with the business goals and priorities of multiple application workloads, and then manage workload priorities and system resources to achieve the business objectives for all active workloads. Using a feedback loop, goal-based resource managers adjust low-level allocations according to their impact on the high-level goals. HP-UX WLM was the first UNIX-based product that automatically reallocates resources based on Service Level Objectives (SLOs).

HP's Virtual Server Environment integrates the resource management functions of PRM and HP-UX WLM with other system functions that affect application service levels, including high availability clusters, partitions, and utility pricing options. As a result, VSE provides users with a single workload management infrastructure that can comprehensively manage service levels for applications. The result is a server environment that can dynamically and automatically grow and shrink to meet the business demands of a particular application.

All of the major system vendors, including IBM, have introduced initiatives that promise to comprehensively address virtualization requirements. Most operating systems now offer native resource management tools that can be used to assign resources to applications with great precision. However, HP's Virtual Server Environment benefits from a number of advantages over competitors including: the maturity of its core resource management tools, PRM, and HP-UX WLM; functional capabilities that are unique in the UNIX space, i.e. capacity planning tools that allow workload placement simulation prior to implementation; and the integration of resource management tools with other key system functions, including high availability clusters, disaster recovery options, partitions, and utility pricing options. The net effect is a leading-edge virtualization environment that offers a pool of resources for servers to use as they dynamically adjust to meet changing business demands.

The dynamic nature of these virtualized resources changes how businesses allocate resources to applications. Instead of putting one application on one operating system image on one server sized for the peak workload, customers can now consolidate the applications on a single server, size those applications for their normal workload, and have a pool of resources that can move between workloads to handle peak computing demands. This significantly improves overall server utilization. It reduces the amount of resources required to complete the same amount of work while maintaining service levels and makes a significant impact on hardware, software, and support costs.

Competitive Comparison

In this section, we compare HP-UX 11i running on 8-way rx7620 mx2 1.1GHz servers with a competitive IBM AIX 5L configuration running on 8-way eServer p5 570 1.9 GHz servers to determine which solution delivers the lowest TCO and highest ROI. Companies that implement HP-UX 11i can experience significant five year TCO savings of more than 15%.

TCO Comparison (5 year cumulative costs)	IBM AIX 5L	HP-UX 11i	Savings with HP-UX 11i	Savings with HP-UX 11i
IT Costs				
Direct Costs				
Server Hardware	\$1,344,350	\$1,200,375	\$143,975	10.7%
Server Software	\$1,508,168	\$1,294,356	\$213,812	14.2%
IT Operations	\$451,540	\$431,255	\$20,285	4.5%
IT Administration	\$13,080	\$13,080	\$0	0.0%
Facilities	\$34,025	\$37,955	(\$3,930)	-11.6%
Change Costs	\$197,246	\$29,659	\$167,587	85.0%
Total IT Costs	\$3,548,409	\$3,006,680	\$541,729	15.3%
Business Operating Costs				
Indirect Costs				
Unplanned Downtime	\$70,755	\$19,165	\$51,590	72.9%
Planned Downtime	\$61,170	\$61,170	\$0	0.0%
Security Related Downtime	\$170,255	\$167,305	\$2,950	1.7%
Total Business Operating Costs	\$302,180	\$247,640	\$54,540	18.0%
Total	\$3,850,589	\$3,254,320	\$596,269	15.5%

The benefits of HP-UX 11i with HP Integrity server platform over IBM AIX 5L / p5 570 include:

- Superior consolidation with virtualization options and workload management
- Broadest on-demand technologies
- Multi-OS partitions² and virtualization on single server
- Growth to 2x CPUs using mx2 processors
- Lowest change costs when migrating from older platforms and operating systems
- Future choice of major Operating Systems

TCO Advantages of HP-UX 11i vs. IBM AIX 5L	Benefits
Reduced Hardware Costs	Utilizing comparable configurations, the HP solution on an HP Integrity 8-way processor offers a 22% savings in initial hardware costs over the IBM AIX 5L with an 8-way processor p5 570 configuration.
Reduced Software Costs	Comparing operating system costs, typical HP to IBM application and database licensing and environment costs drive a 14% initial licensing and ongoing support and maintenance advantage for HP over a typical five year analysis period.
IT Operations and Administration Savings	<p>Administration tools include single point systems management, virtualization management, resource management, workload management, capacity advisory tools and integrated security features and practices.</p> <p>Open systems standards help to lower specialized skill sets, share resources and reduce labor rates.</p>
Change Cost Savings	With HP fewer internal labor person hours are required to implement the solution. This along with reduced professional services and testing costs compared to competitive offerings results in a potential 85% cost savings.
Multi-OS Consolidation and Virtualization	<p>Server consolidation is well proven to lower asset costs through better utilization of hardware assets and less demand for software licensing. These savings are typically 20% in hardware and software savings. In addition to the asset cost avoidance, IT operations and administration costs typically consume 50% or more of the total cost of ownership for business-critical servers, and these costs can be proportionately reduced through asset consolidation – reducing the number of assets, deployments and configurations to manage. Reducing these costs can deliver more efficient IT operations and empower organizations to reallocate resources from mundane maintenance and support to value added strategic initiatives. HP Integrity servers running hard partitions can host multi-variant operating systems on a single server including OpenVMS, UNIX HP-UX 11i, Linux, and Windows, resulting in IT operations and administration cost savings almost proportional to server consolidation levels.</p> <p>Virtualization of a consolidated environment drives additional savings. Virtualization is an approach to IT that pools and shares resources to optimize utilization so that the supply automatically meets demand. When integrated virtualization technologies are deployed, overall server utilization increases, resulting in fewer resources being required to perform the same workload. If fewer CPUs are required to perform the same work, it reduces not only</p>

² A function of the hardware rather than the operating system.

	<p>the hardware costs, but also the software and support costs.</p> <p>The HP Virtual Server Environment (VSE) is a total package solution providing increased resource utilization while maintaining continuous service levels. The IBM virtualization engine (VE), however, is missing many key features provided by HP VSE. HP's VSE product portfolio covers all bases of control: plan (Capacity Advisor), configure (Virtualization Manager), automate (WLM / gWLM), and common management (HP Systems Insight Manager). IBM has announced many control capabilities, but still has not fully delivered. The focus for IBM appears to be more on virtualizing resources, rather than management and control. By separating virtual "access" from "management", IBM adds further complexity to its solution, paving the way for HP's unified infrastructure management with HP SIM. In order to provide a total package for IBM to compete with HP's integrated VSE, additional software is required such as IBM's virtualization engine, Tivoli and WebSphere, increasing the overall cost of providing a virtualized IBM solution.</p>
<p>Future Proofing</p>	<p>Because the Integrity server platform supports hard partitions, the organization has the flexibility to migrate to Linux, Windows, and OpenVMS without requiring a hardware change. The Integrity based solution with HP-UX 11i offers the business protection against future changes and preservation of the initial investment regardless of changing business, market, or customer needs.</p> <p>Upgrades to mx2 dual processors, a direct plug-in upgrade which can double the number of processors in a given server box, can generate a near doubling of processing capacity in the same server and footprint avoiding the requirement to buy larger server platforms up-front with room for future expansion, and avoiding the need to add additional server boxes to handle the growing need for computing capacity.</p> <p>Utility pricing capacity includes: instant turn on CPUs, ability to enable or disable CPUs on a temporary as needed basis, ability to pay based on actual metered usage, as well as memory on-demand.</p>

For the analysis, a multiple application portfolio is to be migrated from an existing Tru64 UNIX® server configuration to run on either HP-UX 11i with three 8-way HP Integrity rx7620 mx2 servers or IBM AIX 5L with three 8-way IBM eServer p5 570 servers. The following configuration was used for this scenario:

Primary industry classification	Manufacturing
Primary geographic location	United States
Data center location	Suburban
Annual revenue or equivalent (in millions)	\$1,000.0
Net incremental contribution	15.0%
Primary business application	Multiple (Application Portfolio)
Number of applications	8
Total number of users	1,000
Total storage requirements (in GB)	5,120
Existing platform	Tru64 UNIX ®
Database software	Oracle

Hardware Costs

Over the five year analysis period, the hardware costs including initial procurement and ongoing maintenance for HP-UX and Integrity 8-way rx7620 mx2 are estimated to be a 10.7% savings when compared to the comparable IBM AIX 5L p5 570 8-way platform configuration.

For this set of supply chain management applications, three HP Integrity 8-way rx7620 mx2 (1.1GHz) servers on HP-UX 11i with workload optimized virtualization are being compared to three IBM p5 570 8-way (1.9GHz) servers on AIX 5L with partitioning.

While some IBM server performance benchmarks are higher than the HP Integrity, benchmarks such as TCP-C and TCP-H, this can sometimes be misleading. Benchmarks are designed and tuned to push servers and software to their limits under the most demanding workloads and limits of

compute power. Oftentimes tuning for benchmarks is not the same as would be used in everyday environments. Infrastructures benefit most from ensuring they are designed to balance overall workloads. For this project, IBM needs approximately the same number of processors as HP systems to handle the workload.

Utilizing these configurations, based on Ideas International list prices for September 2005, and 40% hardware cost discounts from list pricing, initial procurement costs for the HP-UX 11i solution with workload virtualization and mx2 dual processors are 22% less than the configured IBM AIX 5L solution.

Maintenance and support contracts are difficult to compare because service levels can vary from program to program leading to differences in service levels vs. pricing. Because there are no service level offering benchmarks or standards to refer to, program pricings were obtained from Ideas International, and adjustments were then applied to align the program offerings, service levels and costs. Over a five year period, maintenance and support service contracts are expected to average \$34,084 per year over the five year lifecycle for the specified HP-UX 11i configuration and \$41,053 for the specified IBM AIX 5L configuration.

In total over the five year analysis period, the hardware costs including initial procurement and ongoing maintenance for the HP-UX 11i configuration are estimated to be a 10.7% savings when compared to the comparable IBM AIX 5L configuration.

Hardware Costs	IBM AIX 5L	HP-UX 11i	Savings with HP-UX 11i
Server platform	3 - IBM eServer p5 570 (8way)	3 -HP rx7620 mx2 (8 way)	
Hardware cost	\$513,165	\$340,842	\$172,323
Storage	\$614,400	\$614,400	\$0
Network cost	\$11,520	\$11,520	\$0
Instant capacity	\$0	\$63,193	(\$63,193)
Annual HW maintenance / support contracts	\$41,053	\$34,084	\$6,969
Total (5-year)	\$1,344,350	\$1,200,375	\$143,975

Software Costs

With the specified HP-UX 11i / BEA Weblogic / Oracle solution, there is an almost 15% savings in licensing costs versus the proposed IBM AIX 5L / Websphere / DB2 solution.

Re-hosting or migrating applications and databases often requires that the legacy software infrastructure is replaced with newer versions. The software configuration modeled in this analysis consists of the purchase of new operating system, application server (middleware), and database licensing.

For HP, the solution consists of a typical deployment of BEA Weblogic application server and Oracle RAC, managed with HP OpenView. For IBM, the solution consists of a WebSphere application server, a DB2 database, additional IBM storage management and disaster recovery utilities to match integrated HP-UX 11i capabilities, and Tivoli systems management.

Based on the licensing requirements for the configuration, and using a 40% discount on list prices, initial software licensing costs are expected to be \$369,960 for the HP-UX 11i solution, and \$465,168 for the IBM AIX 5L solution. With HP, 14% five year ownership cost savings are projected.

The major cost difference between HP and IBM regarding software costs is that IBM AIX 5L does not explicitly charge for operating system support, but bundles the cost in with the systems purchase.³ The bundling of the operating system and annual support costs makes it difficult to understand the true cost of operating system ownership with the IBM AIX 5L solution – operating system versus hardware, and also typically makes the IBM hardware much more expensive for a comparable solution.

Overall, including the initial licensing and annual support and maintenance contracts, the HP solution provides a 14.2% savings over a five year period compared with the IBM AIX 5L solution.

Software Costs	IBM AIX 5L	HP-UX 11i	Savings with HP-UX 11i
Operating system	\$110,715	\$140,256	(\$29,541)
Application licenses needed	12	12	
Application licensing (per unit)	\$9,000	\$10,200	
Application licensing total	\$108,000	\$122,400	(\$14,400)
Database licenses needed	7	7	
Database licensing (per unit)	\$31,800	\$24,000	
Database licensing total	\$222,600	\$168,000	\$54,600
Systems management licenses needed	3	3	
Systems management licensing (per unit)	\$18,000	\$15,000	
Systems management licensing total	\$54,000	\$45,000	\$9,000
Disaster recovery	\$80,568	\$34,560	\$46,008
Annual maintenance and support contracts on software	\$186,457	\$156,828	\$29,629
Total (5-year)	\$1,508,168	\$1,294,356	\$213,812

³ The IBM configuration takes into consideration the cost of the necessary software and add-ons to make the configurations comparable to the different HP operating system support levels (Foundation, Enterprise, and Mission Critical).

IT Operations and Administration

HP clearly has an advantage in labor cost savings. By utilizing a non-proprietary Intel Itanium based platform, resources can cost the organization less. With the specified HP configuration, a 4.5% labor cost savings is expected compared to the IBM AIX configuration.

With the specified HP configuration, a 4.5% labor cost savings is expected compared to the IBM AIX configuration. These resources are responsible for planning, configuring, automating, and managing.

HP clearly has an advantage in labor cost savings. By utilizing a non-proprietary Intel Itanium based server platform, resources to manage the systems can often cost the organization 3-10% less. As a result of an open-system configuration, management resources can be shared with other Intel platforms helping to leverage more data center

resources for infrastructure, messaging, and mission critical computing.

For server centers, typically labor costs are driven by the number of assets being managed and the complexity of the configuration. Fewer servers needed to meet workload drives less resources. Simplified configurations, platform, and standardization help reduce the need for unique resources and simplify tasks. Because the comparative configurations are so similar from an asset count and complexity standpoint, the headcount requirements for managing and supporting the platforms are similar. However, even though not included as a benefit in this analysis, most multi-application and OS environments can experience a further 5% reduction in headcount requirements with HP.

HP's broad set of management tools works with HP-UX 11i to provide comprehensive views of the entire IT environment, helping to improve the ratio of servers per administrator. These tools include:

- 1) Central point of administration can be performed with HP Systems Insight Manager – managing multiple platforms, storage, virtualization, and operating systems from a single console.
- 2) HP Integrity Essentials Virtualization Manager offers the first comprehensive, easy-to-use virtualization management software, helping to reduce complexity through integrated configuration management of physical and virtual servers, and increase control through unified visualization of all types of virtualized servers – from sub-CPU to multi-system.
- 3) HP Process Resource Manager (HP PRM) and HP-UX Workload Manager (HP-UX WLM) enable HP to help businesses automatically align server resources with business needs, offering granular control of system resources, operations, and configuration.
- 4) For improved planning, HP Integrity Essentials Capacity Advisor helps the team simulate the placement of application workloads to help IT administrators optimize server utilization. These features make it easier to manage applications, workloads, utilization, capacity planning, performance and availability from a single-point of control for reduced complexity and management costs.
- 5) To help address security efficiency and effectiveness, a growing cost in almost every enterprise, newly integrated security features such as identity management and a long list of enhanced / existing features such as Host IDS, IP filtering, IP security, Secure shell, OpenSSL, Security patch-check, Security hardening and lockdown help to keep the cost of security management lower than competitive platforms.

By contrast, IBM does not currently offer true workload optimizing virtualization for intelligent, goal and demand based asset optimization, does not provide a way to do multi-OS partitions, does not provide a way to setup fully isolated partitions (often a business unit requirement for buy in), does not include as comprehensive a set of planning tools integrated with the virtualization engine, and does not have a set of integrated configuration tools - all of which are integrated features of HP-UX 11i (see Security section for more information on additional security features which also help to drive IT operations and administration costs lower).

IT Operations Labor	IBM AIX 5L			HP-UX 11i		
	Annual FTEs	Average Burdened Salary	Total Annual Cost (year 1)	Annual FTEs	Average Burdened Salary	Total Annual Cost (year 1)
Service desk	0.007	\$54,810	\$384	0.007	\$52,346	\$366
Performance and availability management	0.019	\$91,349	\$1,736	0.019	\$87,244	\$1,658
User administration	0.012	\$91,349	\$1,096	0.012	\$87,244	\$1,047
OS support	0.011	\$91,349	\$1,005	0.011	\$87,244	\$960
Break-fix management	0.011	\$91,349	\$1,005	0.011	\$87,244	\$960
Software deployment	0.054	\$91,349	\$4,933	0.054	\$87,244	\$4,711
Application management	0.032	\$91,349	\$2,923	0.032	\$87,244	\$2,792
Systems management	0.064	\$91,349	\$5,846	0.064	\$87,244	\$5,584
Disk and file management	0.011	\$91,349	\$1,005	0.011	\$87,244	\$960
Storage management	0.749	\$91,349	\$68,420	0.749	\$87,244	\$65,346
Security management	0.006	\$91,349	\$548	0.006	\$87,244	\$523
Database management and administration	0.014	\$100,484	\$1,407	0.014	\$95,968	\$1,344
Total	0.99		\$90,308	0.99		\$86,251
Total (5-year)			\$451,540			\$431,255

Facilities and Overhead Cost Savings

Lower power and floor space costs for the HP rx7620 mx2 servers help to offset the higher HVAC costs when compared to the IBM eServer p5 570 servers. The overall impact of the higher HVAC costs is reduced to a \$3,935 advantage for IBM.

Overall facilities and overhead costs for the HP-UX 11i configuration are slightly higher than with IBM AIX because of higher HVAC requirements. The HP rx7620 mx2 (8 way) server averages 300 watts of power less per server per hour than the IBM eServer p5 570 (8 way), but loses its advantage with higher HVAC wattage per server per hour required. The higher HP HVAC costs are also offset by the smaller footprint of the HP servers compared to the IBM servers.

Facilities and Overhead	IBM AIX 5L	HP-UX 11i	Savings with HP-UX 11i
Server platform	IBM eServer p5 570 (8 way)	HP rx7620 mx2 (8 way)	
Power per server per hour (in Watts)	1,400	1,100	
Annual power costs (at \$0.09 per kWatt/hour)	\$3,302	\$2,595	\$707
HVAC per server per hour (in Watts)	1,384	2,030	
Annual HVAC power costs (at \$0.09 per kWatt/hour)	\$3,264	\$4,788	(\$1,524)
Space consumed per server	1.27 sq ft	1.11 sq ft	
Annual floor space costs (\$62.50 per sq foot/year per server)	\$238	\$208	\$30
Total (5-year)	\$34,020	\$37,955	(\$3,935)

Change Cost Savings

Change costs typically include the cost to setup the new server environment including:

- 1) Design, planning, and training
- 2) Hardware and software procurement, installation, and setup
- 3) Recompilation and migration of the application
- 4) Migration of databases
- 5) Decommission, cascade, or retirement of the old systems

The comparison indicates an 85% savings for HP-UX 11i in change costs versus IBM AIX 5L.

In this analysis, HP-UX 11i and HP support services including foundation configuration, readiness analysis – comprehensive, readiness analysis - self assessment, and server specific education help to lower initial labor costs,

while application porting tools and run-time compatibility help to reduce the need for expensive application development porting labor and recompilation efforts. These tools and services result in less internal labor needed to perform migration tasks, resulting in an estimated 85% cost savings when migrating from the scenario’s Tru64 UNIX® environment.

With IBM AIX 5L, change costs from the current Tru64 UNIX® environment are estimated to be \$197,246 versus \$29,659 for HP-UX 11i, a savings of \$167,587 in initial labor, services and testing costs. Specifically, HP helps reduce the project planning labor and service costs via complimentary and included project management services through their Alpha RetainTrust (ART) program. The comparison indicates an 85% savings for HP-UX 11i in change costs versus IBM AIX 5L.

Change Costs	IBM AIX 5L	HP-UX 11i	Savings with HP-UX 11i
Project cost - labor	\$37,433	\$7,241	\$30,192
Project cost - services	\$158,880	\$22,240	\$136,640
Project cost - testing	\$933	\$178	\$755
Total (5-year)	\$197,246	\$29,659	\$167,587

Unplanned Downtime

HP-UX 11i has a more reliable platform and more high availability / business resilience features resulting in fewer downtime hours and less impact to end user productivity. Over the five year analysis period, a \$51,590 advantage is achieved, a 72.9% savings over IBM AIX 5L.

The HP-UX 11i configuration is superior to the IBM AIX 5L configuration for server availability. Even the smallest differences in unplanned downtime can result in significant impacts to end user productivity. In a high availability clustered environment with a metro disaster recovery configuration, the HP-UX 11i solution experiences 0.70 hours less downtime per year than the IBM AIX 5L configuration, resulting in a substantial savings of \$51,590, a 72.9% savings over the five year analysis period.

Unplanned Downtime	IBM AIX 5L	HP-UX 11i	Savings with HP-UX 11i
Availability	99.989%	99.997%	
Annual unplanned downtime hours	0.96	0.26	
Cost per unplanned downtime hour	\$14,741	\$14,741	
Total annual cost (year 1)	\$14,151	\$3,833	\$10,318
Total (5 year)	\$70,755	\$19,165	\$51,590

To drive superior availability, HP has enhanced and integrated Serviceguard within HP-UX 11i v2 to provide a unified management engine that allows workloads to "fail over" within partitions of a single Integrity server frame or between clustered HP-UX 11i v2 servers. Serviceguard enables the organization

to configure clusters in a number of different ways based on mission critical nature of the application including real application cluster management, and extended distance clusters, including continental clusters.

Extending high availability to storage, HP Serviceguard Storage Management Suite combines the power of the number one high availability UNIX solution, HP Serviceguard, the flexible and scalable Integrity server platform and on-demand offerings with Virtual Server Environment (VSE) and Symantec's VERITAS Storage Foundation, to produce a comprehensive highly available clustering and file management solution for HP-UX 11i.

Security Related Downtime

Although security related investments by organizations have been increasing substantially each year for the past five years, 2005 was another banner year for high-profile security attacks. While several high profile data thefts were made against brand name companies and captured the headlines, the frequency of more mundane network intrusions, denial of service, worms, Trojans, and virus attacks remained at all time highs. According to almost all of the security analysts, 2006 promises to be another year of equally prolific and more sophisticated attacks. As a result, it is essential that the data center contain the tools and practices to fortify and prevail against these ever sophisticated hacking and cyber attacks.

Designed to enable Internet-based technologies and layered security, HP-UX 11i has integrated the policy, authorization and access control, identification and authentication, audit and alarms, privacy and integrity, and identity management solutions needed to best mitigate these threats.

HP-UX 11i uses certified secure operating system platforms and includes all of the following integrated features for no additional acquisition or service cost and without the need to add additional utilities or security management solutions:

- Host IDS
- IP filtering
- IP security
- Secure shell
- OpenSSL
- Security patch-check
- Security hardening and lockdown
- Identity management integration

As a result of these integrated features, HP-UX 11i has an estimated 2% security resilience advantage over AIX 5L. For most e-business or mission critical environments, this can lead to thousands of dollars in annual downtime loss avoidance.

Identity Management Integration

One of the newest additional security features, HP-UX 11i Identity Management Integration (IdMI) is the first identity management and single sign-on capability from a single vendor that utilizes the operating system to enforce critical system access and authorizations. Customers benefit from the following features:

- Unified authentication: Single identity, authentication credentials across heterogeneous platforms and applications. Password changes are immediately effected at all enforcement points.
- Group-based access control: Authorizations can be managed by grouping users, simplifying management and ensuring uniform application of security policy. HP-UX 11i can share that grouping information with external applications, allowing similar privileges to be shared among different organizational applications.
- Role-based access control: Authorizations can be granted based on user attributes stored in the directory. Updating the attribute information immediately triggers an update in granted authorizations. As with grouping, roles can allow users to be granted similar privileges among different applications.

- Rule-based access control: Authorizations can be granted based on dynamic requirements such as object, subject or environmental conditions. And even more so, any combination of roles, groups and other information can be combined to define permissions.
- Immediate response to policy change: Explicit policy changes can be applied to the appropriate resources rather than individual users, greatly simplifying policy management.

Directory Server Support

HP-UX 11i provides support for Red Hat Directory Server, a Lightweight Directory Access Protocol (LDAP) compliant software server that centralizes user profiles, application settings, group data, policies and access control information into a network-based registry, Novell eDirectory, the industry's first and most advanced full-service directory server.

HP-UX 11i system security features include:

- 1) Security Containment offers two distinct customer advantages. Since its design is similar to the design of submarine compartments, this feature provides isolation between resources and processes. The penetration on one compartment isolates other compartment or system, reducing unplanned downtime and catastrophic system failures.
 - Unlike containers, process rules allow for processing between compartments. By using this feature, outside compartments can be used to talk to the outside world and then pass information and processing to inside compartments that are isolated from outside threats. Rather than using multiple edge servers, application servers and database servers, application and processes can be consolidated on one server with containment thereby reducing server count.
 - Security containment compartments can also be configured within the VSE environment. Compartments within a VPar are called Secure Resource partitions and act to isolate and protect the VSE partitions in the same way they do for the non-partitioned system, providing the system environment with stronger partitioned security. The VSE environment with Secure Resource partitions allows for secure application stacking, increased server utilization and reduced server count.
- 2) Host Intrusion Detection Service (HIDS) enhances host-level security with near real-time automatic monitoring of each configured host for signs of potentially damaging intrusions. It also provides for protection when coupled with IPFilter on the host so that intruder IP addresses can be filtered out. HP's unique Dynamic Connection Allocation provides protection from Denial of Service attacks. IPFilter provides increased security defense by minimizing the number of server exposure points. This capability is unique to HP-UX since it is built into the OS kernel and not offered by competitive operating system. Using independent third-party software is not real-time, as efficient, or effective as a kernel-based real-time IDS.
- 3) Identity management and single sign-on enforces critical system access and authorization. When coupled with OpenView Select access, identity of both application access and system administration access and control, is managed by using the HP-UX 11i role-based access control (RBAC) feature. Other IdMI systems without this feature require multiple access control systems with the attendant administration overhead and lack of easy administration. In addition to integrated enforcement, customers benefit from single vendor support for this mission critical capability. The Identity Management Integration feature of HP-UX 11i provides authentication and enforcement of user rights within the operating system. By using the Red Hat Directory Server for HP-UX, with HP's Open View Select Access Identity Management System features are seamlessly managed with better security due to RBAC enforced by the OS.

These three security solutions now provide more effective security by combining security technologies into solutions that can be utilized by security sensitive vertical industries. The Security Containment solutions are used by banks and other financial industries for isolation, secure virtualization and secure application stacking reducing server count. The intrusion detection and protection solutions are needed by all enterprises to provide server protection and detection behind the corporate firewall.

By comparison, IBM AIX 5L does not provide integrated and competitive security containment or real-time Host IDS.

Additional information is available at www.hp.com/go/hpux11isecurity.

Time to Solution

To help minimize the time and cost of transition from certain platforms, HP has implemented the most comprehensive set of transition programs that include not only pricing incentives, but transition services, training, and tools. The transition programs help minimize the resources and labor costs of performing the transition, and significantly reduce transition time to solution. When migrating from Tru64 UNIX®, as we are doing in this sample scenario, HP has created the Alpha RetainTrust (ART) transition program which provides specific programs to help minimize the cost, resources, and time spent on transitioning from Tru64 UNIX® to HP-UX 11i. The program includes:

- 1) Transition modules including white papers, training, and “how-to” guides describing various strategies and procedures for transitioning to equivalent or superior Integrity and HP-UX 11i platform infrastructures, Oracle database migrations, ISV transition planning for packaged applications, and custom code transition planning. With these self-paced educational tools, your staff can learn quickly how to identify the steps required for transition, and directly develop strategic and tactical plans.
- 2) Transition tools including migration scoping tools, API scanners, porting tools, impact analysis, build procedures, and migration environments, helping the team to quickly understand the specific impact of the transition, and providing tools to help reduce the amount of programming or script changes.
- 3) Special HP professional services to directly assist the team with the transition of systems and applications.
- 4) Special financial incentives for migrating to Integrity servers and HP-UX 11i.

Complete program details can be found on http://www.hp.com/products1/evolution/alpha_retaintrust/index.html.

For this analysis, utilizing the direct application compatibility features of HP-UX 11i, combined with the unique assistance of the transition modules and tools, HP-UX 11i time to solution costs are 35.6% less than the specified IBM solution.

Time to Solution	IBM	HP-UX 11i	Savings with HP-UX 11i
Business value of application per week	\$11,538,408	\$11,538,408	
Incremental first year revenue or equivalent from application upgrade	5.0%	5.0%	
Time to deploy (weeks)	16	10.3	
Total business value during deployment	\$9,230,726	\$5,942,280	\$3,288,446
Net incremental contribution	15.0%	15.0%	15.0%
Net contribution margin opportunity cost	\$1,384,609	\$891,342	\$493,267

Improving Agility and Future-Proofing the Investment

In today's dynamic business environment, the platform of choice is one that can easily adapt to the future, and HP-UX 11i running on HP Integrity servers represents the most flexible platform for the next generation of the adaptable enterprise.

The need for an adaptable IT infrastructure is driven from many business needs including:

- 1) Mergers and acquisition activity
- 2) New business and product launches
- 3) Growth in user and customer demand
- 4) Product retirement and operation consolidations
- 5) Supply chain and customer integrations
- 6) Outsourcing

In today's dynamic business environment, the platform of choice is one that can easily adapt to the future, and HP-UX 11i running on HP Integrity servers represents the most flexible platform for the next generation of the adaptable enterprise. The agility is a result of being able to simply perform, with integrated and included utilities and capabilities, optimization and reconfiguration of resources to meet changing business needs and workload demands. These include virtualization including workload optimization, multi-OS partitions, in-line hardware upgrades and on-demand computing capacity.

Because of HP Integrity's support of multi-OS partitions, the organization has the flexibility to host multi-variant operating systems and applications on a single server, or in the future, migrate to Linux, Windows, or OpenVMS without requiring a hardware change. This flexibility, which the specified IBM p5 570 platform does not provide, means that applications can be added to the portfolio and not require additional assets to be purchased, installed, and managed in order to support those assets.

The ability to consolidate additional multi-variant OSs and applications can lead to:

- 1) Hardware purchase avoidance for additional servers in order to support the new OS and applications. Each new OS and application can result in a new island of processors, memory, and storage – all typically purchased with additional headroom to support future requirements and growth. By consolidating hardware asset purchases onto the HP-UX 11i, hardware partitions, and even more so, partitions can eliminate the need for this headroom. Operating systems, applications, and workloads can be intelligently managed so as to maximize asset use, eliminating 15-20% of hardware requirements.
- 2) Similarly, software licensing is often proportional to the number of systems and number of processors. By allocating systems and processors without needing the additional headroom purchases, 20% of software licensing costs can be avoided.
- 3) In studies, the cost of IT Operations and Administration is directly proportional to server box count. It can be improved by implementing key best practices including consolidation and standardization, complexity, and IT management capability and maturity. First and foremost to reduce server operations costs, less server boxes directly translates to lower management costs. In typical environments, systems management personnel can typically manage from 20 to 30 servers per full time equivalent. These labor resources typically cost \$100,000 to \$130,000 annually depending on the company location and industry. Each server box on average costs between \$3,300 and \$6,500 each year in IT operations and administration expense.

From a hardware perspective, HP-UX 11i with HP servers provides for two additional future proofing capabilities:

- 1) In-box upgrades to mx2 processors for near doubling of processing capacity in the same server and footprint avoiding the requirement to buy larger server platforms up-front with room for future expansion, and avoiding the need to add additional server boxes to handle the growing need for computing capacity.
- 2) On demand capacity: - Instant turn on CPUs, ability to enable or disable CPUs on a temporary as needed basis, and ability to pay based on actual metered usage, as well as including memory on-demand.

According to Alinean's analysis of top ROIT performers, as published in SearchCIO 200 rankings, companies which are the most responsive and able to adapt their IT infrastructure to changing business needs are better able to meet and exceed goals, and outperform companies which are less agile.

With a more agile infrastructure utilizing HP-UX 11i and HP Integrity servers, the time required to perform each application upgrade is reduced. In a typical environment, four upgrades are expected each year, with the IBM solution expecting to take 4 weeks to perform each application upgrade, while the HP solution can perform each upgrade in just 3.8 weeks. The result is a 5% expected strategic business benefit, or \$69,231 in annual incremental margin contribution.

Business Agility	IBM	HP-UX 11i	Benefits with HP-UX 11i
Average annual revenue or equivalent	\$1,000,000,000	\$1,000,000,000	
Percentage of revenue or equivalent attributable to application	60.0%	60.0%	
Revenue or equivalent attributable to application	\$600,000,000	\$600,000,000	
Revenue or equivalent attributable to application per week	\$11,538,462	\$11,538,462	
Expected application upgrades per year	4.0	4.0	
Weeks to perform each application upgrade	4.0	3.8	
Risk of lost incremental application value due to delays in timely upgrades	5.0%	5.0%	
Revenue or equivalent opportunity cost	\$9,230,770	\$8,769,231	\$461,539
Net incremental contribution	15.0%	15.0%	15.0%
Annual net contribution margin opportunity cost	\$1,384,616	\$1,315,385	\$69,231
Total revenue or equivalent opportunity cost over 5 years	\$46,153,850	\$43,846,155	\$2,307,695
Total net contribution margin over 5 years	\$6,923,080	\$6,576,925	\$346,155

The Business Models

The business models used to produce the TCO / ROI results described in this paper are available for inspection and operation so that these analyses can be completely customized for any particular company, installation, and business scenario. The business model can serve as a guide to developing TCO / ROI business cases for your business. Please contact your HP sales representative for more information on the business models used in this paper or for an individualized TCO / ROI evaluation for your specific business case.

Conclusions

Today there are many choices of various server operating systems and server platforms for hosting mission critical applications - helping to reduce data center costs and improve business capability and agility. By analyzing the total cost of ownership over the useful life of the asset, tallying all costs to plan, procure, deploy, manage, support, and revolve / retire data center assets, organizations can be assured that they are making the best choice to minimize costs. Combining TCO analysis of the purchasing decision with an analysis of the business benefits such as agility and adaptability, organizations can be assured that they are maximizing their IT effectiveness and return on investment.

HP-UX 11i running on Integrity servers presents several compelling TCO and business advantages over the competitive proprietary UNIX RISC-based solution, IBM AIX 5L running on eServers. When hosting, migrating, or consolidating UNIX applications, proprietary RISC-based UNIX platforms such as IBM AIX 5L typically have higher total cost of ownership than comparable HP-UX 11i with Integrity server (Itanium® based) deployments – 15% in our case study scenario. The cost savings with HP includes lower change costs, higher availability advantages, and reduced support costs.

Beyond mere cost savings, additional business benefits, adaptability, and higher ROI result from HP Itanium based Integrity servers via the flexibility of running and consolidating multiple operating systems and applications into a single platform.

Beyond mere cost savings, additional business benefits, adaptability, and higher ROI result from HP Itanium based Integrity servers via the flexibility of running and consolidating multiple operating systems and applications into a single platform. This single platform can adapt to changing business requirements because of the ability to upgrade the hardware to the latest processors, double the computing power in-line, or add computing capacity with various on-demand service offerings. In addition, the single platform has the ability to repurpose the non-proprietary

hardware to other operating systems and applications more easily than with proprietary solutions from IBM.

About Alinean

Since 1994, the Alinean team has been the pioneering builder of tools to help quantify and improve the ROI and TCO of IT investments. Alinean was named for the Spanish word for “Align”, matching the Alinean mission as the leading developer of analytical tools to help IT vendors, consultants and IT executives align IT investments with business strategies.

The Alinean team has over a decade of experience in the practical development and application of ROI and TCO methodologies, models and tools to optimizing IT investment decision making. In 1994, the Alinean team formed Interpose, the original pioneers of ROI tools, developing analytical software for over 50 major IT vendors and consulting companies worldwide, and creating the industry standard TCO Manager and TCO Analyst software. Interpose was sold to Gartner in 1998, where the team continued their developments and marketing of ROI and TCO software tools. The original team reunited to form Alinean in 2001, once again becoming the leading pioneers and developers of ROI sales and analytical tools. Current customers include leading IT solution providers such as HP, IBM, Dell, Intel, Symantec, NetIQ, EMC, SAP, Oracle, SBC, and Microsoft, as well as leading consultancies and Global 1000 companies.

Additional information about Alinean and helpful ROI educational resources can be found at <http://www.alinean.com>.