

The Business Value of HP-UX 11i

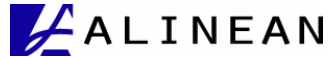
HP-UX 11i vs. IBM AIX

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

www.alinean.com

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

October 2004



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Published by:

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October 2004

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Introduction

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 90% of existing IT budgets are spent on sustaining and evolving the computing infrastructure and delivering mission critical and utility services.¹ Therefore, helping to reduce data center infrastructure costs represents one of the most substantial savings opportunities for most IT organizations.

Savings of up to 12% over IBM AIX on p690² servers can be expected with HP-UX 11i on HP Integrity Itanium based Intel ® servers, with incremental agility and adaptability benefits providing additional upside for a total savings of 14% or more.

At the same time, business environments are more dynamic than ever driving the need for more agile data centers, with the ability to scale and adapt to changing business and user demands such as new business opportunities and mergers and acquisitions.

Today there are many choices of operating system platforms and servers to help meet the challenges of lower costs and higher adaptability. This white paper will explore two platform options, comparing HP-UX 11i, a

UNIX solution hosted on an open systems platform using HP Integrity servers, versus IBM AIX, a proprietary UNIX solution. The paper will demonstrate how open systems UNIX solutions, management, consolidation, virtualization, adaptability, security, and availability can provide substantial benefits in business critical computing environments. With these best practices implemented with the HP-UX 11i platform, significant cost savings and benefits can be delivered over IBM AIX. Savings of up to 12% over IBM AIX on p690² servers can be expected with HP-UX 11i on HP Integrity Itanium based Intel ® servers, with incremental agility and adaptability benefits providing additional upside for a total of 14% or more.

To help organizations understand which operating system and server infrastructure offers the best business value, Total Cost of Ownership (TCO) analysis was utilized. When making a purchasing decision initial procurement price is certainly important – selecting the lowest cost asset in order to save the company money. But studies have shown that if you consider the cost of the asset from initial purchase through deployment, maintenance, support, management, and ultimately to retirement, less than 20% of the costs are for the initial hardware and software investment. TCO analysis helps decision makers make more intelligent investments by analyzing the total cost of the asset over its useful life. This ensures that the decision is not made simply on the lowest initial purchase price, but considers change costs, ongoing support and maintenance, and service levels. In TCO analysis the following lifecycle costs are typically included:

- § Hardware and software
- § Labor and service fees for change costs such as planning, porting, testing, and deployment
- § Labor and service contracts, ongoing management, administration, and maintenance and support
- § Facilities costs and overhead
- § Change costs
- § Availability and the impact of downtime losses

¹ According to Alinean ROIT™ research, only 10% of IT budgets are currently designated for innovation and new functions. The burden of ongoing IT operations, management, and maintenance commands 65% of the budget, while migrations and upgrades consumes 25% annually.

² As of the writing of this white paper, the IBM p5 series was announced but not available for deployment. For this reason, it was excluded from the analysis because real-world TCO could not be verified. Utilize the HP ROI Analyst Enterprise modeling tool to perform an analysis with the latest systems and specific scenarios which may be different than the samples documented here.

To enhance the analysis and assure that the decision is not just based on cost, a common criticism of TCO analysis, comparative business benefits are added to the TCO analysis. By considering not only the costs, but the business impact of the decision, the team can help improve the efficiency of IT via lower lifecycle costs, and seek to maximize business value.

Several business benefits were considered in the analysis:

- § Improving the time to solution
- § Increasing user productivity
- § Improving customer satisfaction
- § Driving additional revenue opportunities

In this white paper, TCO analysis is specifically used to compare mission critical hosting options for the data center in order to drive IT efficiency and effectiveness improvements, comparing HP-UX 11i on Integrity Itanium® based servers versus a proprietary RISC-based IBM AIX solution.

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, significantly reduce ongoing operations management and maintenance, improve availability, and increase adaptability for business critical computing.

The Bottom Line – HP-UX 11i vs. IBM AIX

When hosting, migrating, or consolidating UNIX applications, a proprietary RISC-based UNIX platform such as IBM AIX with p-series servers has a 12% higher total cost of ownership than comparable HP-UX 11i with Integrity server (Itanium® based) deployments (14% or more when indirect benefits such as time to solution and business agility are considered). The cost savings and business benefits with HP include:

- § 22% better cost / performance
- § 41% reduced support costs for hardware
- § 30% reduced facilities costs
- § 58% lower change costs
- § 20% in time to solution savings and accelerated application benefits
- § \$900,000 in annual incremental margin from business agility benefits

The cost savings with HP include better cost / performance, reduced support costs, reduced facilities costs, and lower change costs.

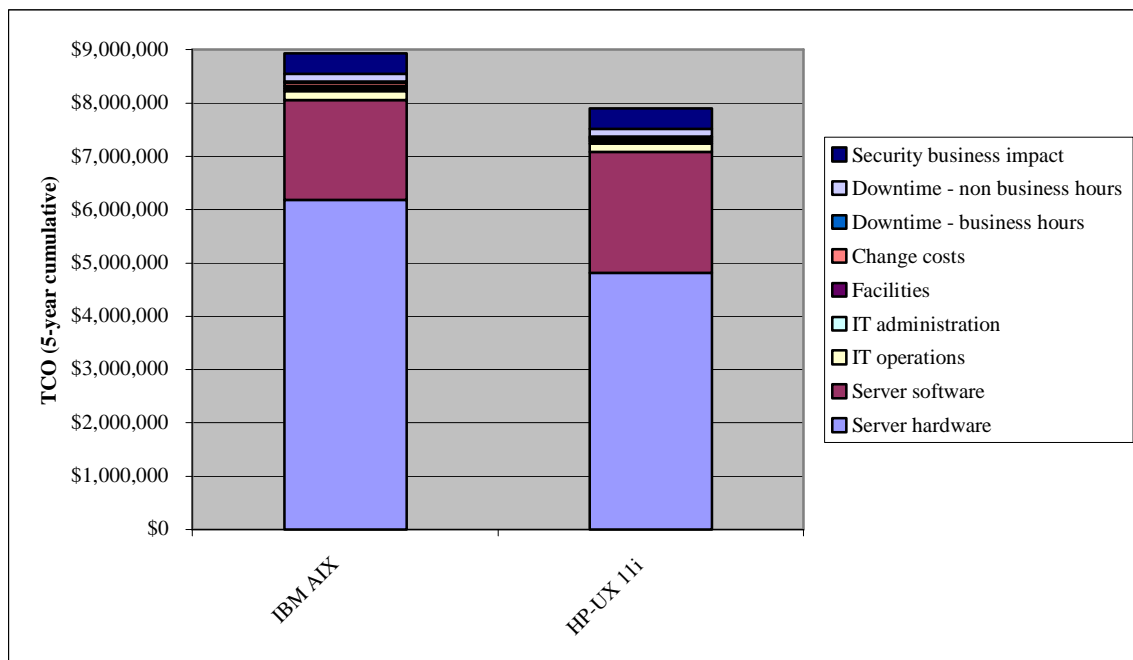
Additional business benefits include better adaptability and business agility.

HP Integrity Servers offer additional benefits beyond mere cost savings. This new generation of HP servers offers the flexibility of running and consolidating multiple operating systems and applications into a single platform that can adapt to changing business requirements. HP has the ability to upgrade older hardware to the latest processors in box, and can double the computing power in-line or add computing capacity with various on-demand service offerings. HP Integrity servers also have the ability to repurpose the non-proprietary hardware to other operating systems and applications. This makes the HP Integrity server the most flexible mission critical server versus a proprietary RISC

solution from IBM.

This analysis was modeled and analyzed independently and the cash flows of investments and benefits are compared to determine which solution cost more over a five year lifecycle. For this analysis a scenario was established for a particular application, OS and system upgrade, with specific configuration plans and benefit opportunities. Assumptions were applied such as typical businesses, applications, locations, best practices (people, process, and technologies), platforms, configurations, costs, and discounts in order to arrive at results which could be applied easily to those considering the various alternatives. The summary of the results are presented in this white paper.

TCO (5 year cumulative costs)	IBM AIX	HP-UX 11i	Savings with HP-UX 11i	Savings with HP-UX 11i
Server hardware	\$6,178,336	\$4,817,893	\$1,360,443	22.0%
Server software	\$1,876,350	\$2,262,330	(\$385,980)	-20.6%
IT operations	\$165,185	\$157,775	\$7,410	4.5%
IT administration	\$47,340	\$47,340	\$0	0.0%
Facilities	\$49,810	\$34,710	\$15,100	30.3%
Change costs	\$58,676	\$24,712	\$33,964	57.9%
Downtime - business hours	\$29,190	\$29,190	\$0	0.0%
Downtime - non business hours	\$137,360	\$137,360	\$0	0.0%
Security business impact	\$389,765	\$389,765	\$0	0.0%
Time to solution	\$4,326,966	\$3,461,573	\$865,393	20.0%
Total	\$13,258,978	\$11,362,648	\$1,896,330	14.3%



Summary TCO Analysis

TCO Analysis Methodology

With the current focus on fiscal responsibility and due diligence, CIOs and IT executives have indicated in ComputerWorld and CIO Insight surveys that more than 80% of current IT purchases require financial analysis for justification. This white paper analyzes the TCO of various data center server strategies, configurations, and platforms. 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 certain scenarios and competitive situations.

The analysis was conducted using TCO and ROI models developed by Alinean, the leading ROI consultancy, whose founders were the original developers of the Gartner TCO Manager and Analyst benchmarking tools. Alinean applied IT spending and TCO benchmarks modeled for over 30 different

industries and over 15,000 companies. This baseline information was then used to model typical data center strategies and best practices of the competitive server and operating system solutions. The calculations are performed using comparable competitive scenarios, with all calculations performed in US dollars, using list pricing for hardware and software investments, burdened labor rates for the defined industries and US urban locations.

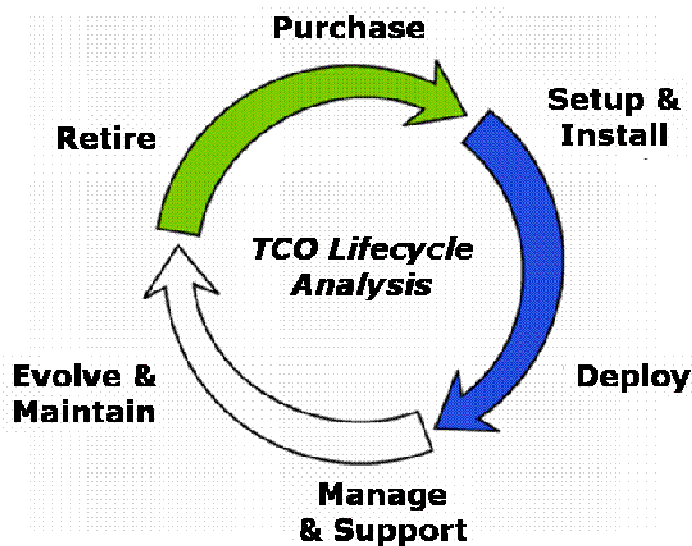
Metrics for the hardware and software costs were developed in conjunction with HP, for HP server and software pricing, and Ideas International, Inc. for HP and competitive solutions. The TCO metrics for all sections were validated as of July, 2004.

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 as 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 scenario that the analysis was established for, which is highly dependent on application type, industry, users and workload, current system and application configurations, current IT capability and maturity, and many other factors.

In the TCO analysis, list prices are exclusively utilized for hardware and software costs. List price is well documented and predictable, whereas discounted pricing is dependent on volume and enterprise purchase agreements, negotiations, and other factors; therefore, list price versus street pricing is utilized. To see how a specific scenario and systems will compare using particular discount rates, the information can be entered into 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.

The TCO model calculates the lifecycle costs and benefits for several competitive operating system and server platform configurations and best practices over a five year analysis period, the typical useful life of business critical servers. The analysis quantifies initial investment requirements, ongoing expenses, change costs, and downtime costs of each competitive solution – comparing and contrasting the costs for head-to-head assessments.



TCO Lifecycle Analysis calculates the total cost of owning the asset from initial planning and procurement through retirement.

TCO Categories

Total Cost of Ownership (TCO) categories are used to collect cost of ownership metrics and place them in accounting categories to enable comparisons and analysis of various alternative solutions and improvements. 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.
Software	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 strategic management and overhead tasks in running the data center including vendor management, procurement, asset management, IT finance and chargeback, IT training, and user training course development.
Facilities	Costs for data center floor-space, power consumption, and HVAC cooling.
Change Costs (Upgrade Labor and Services)	The labor cost, services, and application migration / porting to upgrade or migrate servers, applications, and databases. These costs include: downtime, installation, training, testing, data conversion and migration, systems setup and installation, recompiling applications, loading OS, loading applications, and de-installation and retirement of existing assets.
Availability	Planned downtime to perform regular maintenance and upgrades. Unplanned downtime from hardware and software failures, data-loss, security issues, human error, capacity, accessibility, and response issues. The cost for availability 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.
Strategic Business Benefits	Agility, flexibility, and adaptability to handle changing business demands and requirements resulting in additional revenue and business

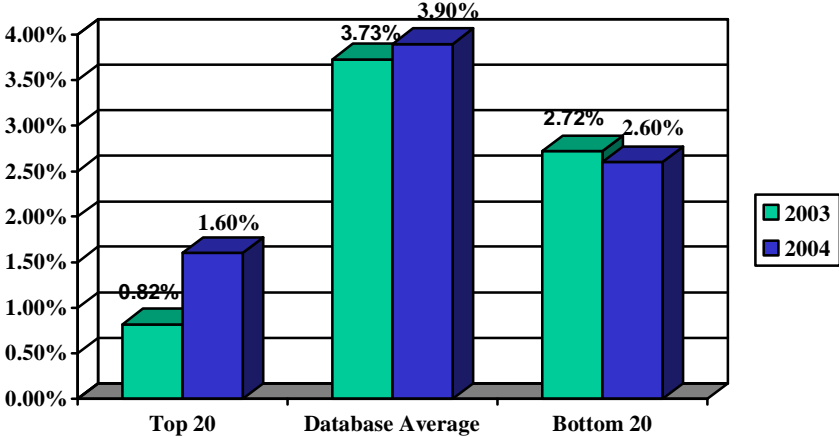
	<p>opportunities such as that gained by industry standard technologies.</p> <p>Future-proofing investments from change, avoiding future asset or labor costs because the existing system can adapt and absorb change quickly without additional investment.</p> <p>Time to solution deployment comparisons for delivering productivity or revenue enhancing applications more quickly.</p>
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HP-UX 11i Strategic Benefits: Adaptability yields higher ROIT™

In Alinean IT spending and performance studies from 2001 to 2003, it appeared that the most frugal companies were the ones who had superior returns on their IT investments (highest ROIT™)³. In these studies, Alinean examined financial performance using several metrics, including Stern Stewart and Co. EVA®, a measure of a companies sustained profitability, compared to overall IT spending. The results highlighted that the companies who were the most frugal and able to cut spending quickly to match the slowing economy were the winners. During this three year period the metrics did indicate that the companies which did more with less had superior financial returns.

But our most recent studies for 2004 indicate a significant shift in the metrics. The companies with superior EVA performance are increasing their spending at twice the rate compared to the bottom performers, and 50% higher than the average company. Looking back to the early 1990s recovery, we see the same type of shift – those which recognized the recovery 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



Alinean ROIT studies indicate the recent shift in IT spending and ROIT, whereby spending is on the rise on average, particularly for the top performers.

This highlights that it is not the most frugal, or conversely the highest investors who achieve superior competitive advantage and performance. The Alinean performance vs. spending analysis clearly indicates

³ ROIT was developed by Alinean to quantify the companies with the most efficient and effective IT management. The metric compares the net benefits of IT investments to the overall costs, calculated as EVA® divided by total IT spending, where EVA is Stern Stewart and Co. metric for corporate profitability and performance and IT spending is an Alinean research metric that calculates the total cost of IT including formal IT spending, business unit IT spending and shadow IT. The metric launched in mid-2004 is quickly becoming the most recognized standard for calculating the value derived from IT and forms the basis for SearchCIO 200’s ranking of the best performing IT management for US companies.

that the companies which are able to quickly adapt their IT spending and investments to meet changing market conditions are the winners. Agility in the ability to recognize an impending slowdown and reduce costs and recognize market growth opportunities and increase investments generates superior ROIT.

Industry Average	ROIT™ = EVA / IT Spending	EVA (in 000,000s)	Estimated Total IT Spending (in 000,000s)	Estimated Total IT Spending / Revenue	Estimated Total IT Spending / Employee
Oil and Gas Production	205%	\$263.55	\$128.36	1.7%	\$15,347
Pharmaceuticals	165%	\$285.23	\$172.74	4.6%	\$15,324
Tobacco and Cigarettes	158%	\$1,106.75	\$700.33	4.1%	\$21,416
Food and Beverage Production	133%	\$247.39	\$186.40	4.0%	\$10,830
Financial Services and Banks	106%	\$204.70	\$193.32	6.9%	\$20,924
Education	100%	\$17.72	\$17.71	4.7%	\$7,442
Chemicals	81%	\$122.94	\$152.69	4.2%	\$14,056
Publishing and Printing	80%	\$56.91	\$70.97	5.2%	\$11,467
Construction	61%	\$34.25	\$55.98	2.3%	\$10,488
Insurance	40%	\$106.06	\$264.10	3.7%	\$24,579

Alinean analysis of several top performing sectors show the variations in the average returns and spending levels for each industry sector. Comparing company performance to the specific industry average and peer leaders can help set IT spending levels and strategies.

Selecting the system with the lowest initial capital cost is not always the wisest decision, 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. In fact, examining the practices of the highest and lowest performers reveals that managing costs contribute only 15% to the value derived from IT. The ability for the investments to support the company's strategic goals and create or reinforce market position was the highest contributor to success. The ability for the investments to support the company's strategic goals and create or reinforce market position was the highest contributor to success.

Contribution to ROIT™	IT Best Practice
65%	Competitive advantage - How IT supports strategic goals / reinforce market position (alignment)
15%	Frugal / prudent (lower TCO)
10%	Higher project success rates
10%	Strategic outsourcing - Focusing on core competencies and appropriate use of strategic outsourcing

In Alinean surveys of the highest and lower 2004 performers, although there is no single silver bullet for success, aligning IT investments to create or support the company's strategy and market position is key.

Aligning the investment strategy with specific strategic and marketing goals can help the business assure that the investments will yield competitive advantage. And because the ecosystem continually evolves, it is imperative that the infrastructure not only deliver a low cost of ownership, but be adaptable to handle changing market opportunities, product strategy changes, customer and partner needs, business process improvements, mergers and acquisition, and application / platform requirements.

The value of an adaptable enterprise is quantifiably supported by the overall ROIT analysis, but 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, 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 up-front, 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.</p> <p>Moreover, using partitions, 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>Each week the application is in development, the productivity or business benefits cannot be realized. Reducing the time to solution versus competitive solution delivers accelerated value</p>	<p>HP-UX 11i with virtualization requires less physical assets than competitive solutions on average. This helps to reduce costly server procurement, setup, and deployment time.</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</p>

	<p>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>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 launch a new product, new feature, or cost advantage.</p>	<p>The additional business benefits of faster time to solution, HP-UX 11i has the lowest change labor and time requirements when compared to competitive solutions. 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 partitioning

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 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 remains the only 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. automated goal-based resource management in HP-UX WLM; 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 a 32-way Superdome with a competitive IBM AIX configuration running on a 32-way p690 to determine which solution delivers the lowest TCO and highest ROI. Companies that implement HP-UX 11i, particularly on Integrity Superdome servers, can experience significant five-year TCO savings of up to 12%, and achieve additional business agility over IBM AIX, amounting to a total savings of 14% or more.

TCO (5 year cumulative costs)	IBM AIX	HP-UX 11i	Savings with HP-UX 11i	Savings with HP-UX 11i
Server hardware	\$6,178,336	\$4,817,893	\$1,360,443	22.0%
Server software	\$1,876,350	\$2,262,330	(\$385,980)	-20.6%
IT operations	\$165,185	\$157,775	\$7,410	4.5%
IT administration	\$47,340	\$47,340	\$0	0.0%
Facilities	\$49,810	\$34,710	\$15,100	30.3%
Change costs	\$58,676	\$24,712	\$33,964	57.9%
Downtime - business hours	\$29,190	\$29,190	\$0	0.0%
Downtime - non business hours	\$137,360	\$137,360	\$0	0.0%
Security business impact	\$389,765	\$389,765	\$0	0.0%
Time to solution	\$4,326,966	\$3,461,573	\$865,393	20.0%
Total	\$13,258,978	\$11,362,648	\$1,896,330	14.3%

The benefits of HP-UX 11i with HP Integrity server platform over IBM AIX / p690 include:

- Best price / performance
- Superior consolidation with virtualization options and workload management
- Best floor space and power efficiency yielding lower ongoing facilities costs
- Lowest change costs when migrating from older platforms and operating systems
- Future choice of major Operating Systems

- Multi-OS partitions⁴ and virtualization on single server
- Growth to 2x CPUs using mx2 processors
- Broadest on-demand technologies

TCO Advantages of HP-UX 11i vs. IBM AIX	Benefits
Reduced Hardware Costs	Comparing computing power versus costs, the HP solution on HP Integrity Superdome 32-way processor with 64 GB memory offers an estimated 22% price / performance improvement over IBM AIX with a 32-way processor p-690 configuration.
Lower Facilities Costs	HP systems, particularly comparing Superdome versus competitive hardware solutions from IBM, offers 30% or more savings in data center floor space, power, and cooling costs.
Change Cost Savings	<p>With HP support services, various planning and training costs are reduced compared to competitive offerings.</p> <p>With HP-UX 11i, the requirements for application porting and recompilation are reduced compared to IBM AIX, resulting in a potential 50% cost savings.</p>
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 and so that 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 the hardware costs, but also the software and support costs.</p>
Future Proofing	Because of the Integrity server platform and hard partitions, the organization has the flexibility to, in the future, 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

⁴ A function of the hardware rather than the operating system.

	<p>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>
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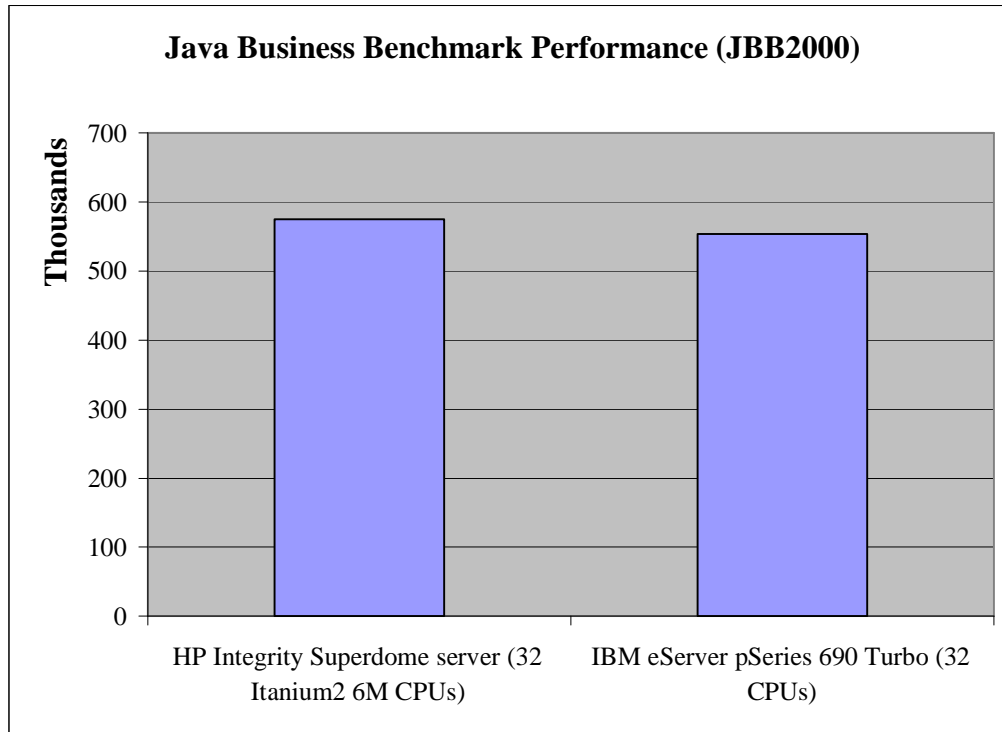
For the analysis, a financial services application is to be migrated from an existing UNIX server configuration to run on either an HP-UX11i on a 32-way HP Integrity Superdome or an IBM AIX on a 32 way IBM p690. The following configuration was used for this scenario:

Primary Industry Classification	Financial Services
Primary Geographic Location	United States
Data Center Location	Urban
Annual Revenue or Budget (in millions)	\$750.0
Average Profit Margin	15.0%
Primary Business Application	Multiple (Application Portfolio)
Number of Applications	4
Total Number of Users	7000
Total Storage Requirements	14,000 GB
Existing Platform	Tru64 UNIX @
Application Software	BEA Systems
Database Software	Oracle
Systems Management Software	HP OpenView
Virtualization Enabled	Yes

Hardware Cost Savings

Over the five year analysis period, the Hardware costs including initial procurement and ongoing maintenance for HP-UX and Integrity 32-way Superdome are estimated to be a 22% savings when compared to the comparable performing IBM AIX p690 32 way platform.

For this application, the HP Integrity Superdome 32 way (1.5GHz) and HP-UX 11i is compared to an IBM p-series 690 32 way (1.9GHz) server. Based on multiple industry benchmark studies including specJBB from www.spec.org, and the results from examining benchmarks using similar applications, databases and workloads utilized in this TCO study, IBM needs approximately the same number of processors as HP systems to be comparable.



According to Spec independent industry benchmarks, found specifically at <http://www.spec.org/jbb2000/results/jbb2000.html>, a 32 processor Integrity Superdome outperforms a 32 CPU IBM pSeries 690 Turbo.

Utilizing these configurations, based on Ideas International pricing for July 2004, initial procurement costs for the HP-UX 11i solution are 41% less than the configured IBM AIX solution. Therefore, the HP Integrity Superdome delivers comparable if not superior performance particularly for Java applications, at a much lower price.

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 \$136,322 per year over the five year lifecycle for the specified HP-UX 11i configuration and \$231,996 for the specified IBM AIX configuration.

Over the five year analysis period, the Hardware costs including initial procurement and on-going maintenance for HP-UX and Integrity 32-way Superdome are estimated to be a 22% savings when compared to the comparable performing IBM AIX p690 32 way platform.

Hardware Costs	IBM AIX	HP-UX 11i	Savings with HP-UX 11i
Server platform	IBM p690 (32 way)	HP Integrity Superdome (32 way)	
Hardware cost per server	\$2,017,355	\$1,195,803	\$821,552
Spares	\$60,521	\$0	\$60,521
Storage (14 TB)	\$2,940,000	\$2,940,000	\$0
Networking	\$480	\$480	\$0
Hardware maintenance and support contracts	\$231,996	\$136,322	\$95,674
Total (5-year)	\$6,178,336	\$4,817,893	\$1,360,443

Software Costs

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 solution.

The software configuration modeled in this analysis consists of the operating system, a BEA WebLogic application server, and an Oracle database. Based on the hardware configuration and processor licensing requirements, initial licensing costs are expected to be \$1,128,410 for the HP-UX 11i solution, and \$904,000 for the IBM AIX solution.⁵

The major cost difference is that IBM AIX does not explicitly charge for operating system foundation and mission critical or enterprise operating system support, but bundles the cost in with the systems purchase. 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 solution. Overall, including the initial licensing and annual support and maintenance contracts, the HP solution costs an additional 21% over a 5 year period compared with the IBM AIX solution.

Software Costs	IBM AIX	HP-UX 11i	Savings with HP-UX 11i
Operating system - mission critical support (per processor)	\$0	\$9,470	
Operating system - high availability	\$81,000	\$0	
Number of processors	32	32	
Operating system total	\$81,000	\$303,040	(\$222,040)
Application licenses needed	16	16	
Application licensing (per processor)	\$10,500	\$10,500	
Application licensing total	\$168,000	\$168,000	\$0
Database licenses needed	16	16	
Database licensing (per processor)	\$40,000	\$40,000	\$0
Database licensing total	\$640,000	\$640,000	\$0
Systems management licensing	\$15,000	\$15,000	\$0
Annual maintenance and support contracts on software	\$194,470	\$227,258	(\$32,788)
Total (5-year)	\$1,876,350	\$2,262,330	(\$385,980)

⁵ The cost for systems management only includes the estimated price for HP Open View systems management, which is similar for both systems.

Facilities and Overhead Cost Savings

The power, cooling, and space savings amounts to a cumulative \$15,100 facilities and data center overhead cost savings (30%) over 5 years when comparing the 32 way Integrity Superdome with the 32 way IBM p690.

IBM AIX running on a 32 way IBM p690 is expected to cost 30% more in facilities and overhead costs compared to an HP-UX 11i running on a 32 way HP Integrity Superdome. The 32 way Integrity Superdome is far more efficient in space utilization, power consumption and cooling costs than the 32 way IBM p690 consuming an estimated 2,626 fewer Watts for power, 1,050 fewer Watts for cooling and 2.07 less square footage per system. The power, cooling and space savings amounts to a cumulative \$15,100 facilities and data center overhead cost savings (30%) over 5 years when comparing the 32 way Integrity Superdome with the 32 way IBM p690.

Facilities and Overhead	IBM AIX	HP-UX 11i	Savings with HP-UX 11i
Server platform	IBM p690 (32 way)	HP Integrity Superdome (32 way)	
Power (in Watts)	8,366	5,740	2,626
Annual power costs (at \$0.09 per kWatt/hour)	\$5,525	\$3,791	\$1,734
HVAC (in Watts)	3,346	2,296	1,050
Annual HVAC power costs (at \$0.09 per kWatt/hour)	\$3,683	\$2,527	\$1,156
Space consumed per server	12.06 sq ft (1.138 sq meters)	9.99 sq ft (.929 sq meters)	
Annual floor space costs (\$62.50 per sq foot/year)	\$754	\$624	\$130
Weight per server	2660 lbs (1,209 kg)	1316 lbs (598kg)	
Total (5-year)	\$49,810	\$34,710	\$15,100

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. Recompile and migration of the application and data
4. Decommission, cascade, or retirement of the old systems

The comparison indicates a 58% savings for HP-UX 11i in change costs versus IBM AIX.

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.

With IBM AIX, change costs from the current Tru-64 UNIX environment are estimated to be \$58,676 versus \$24,712 for HP-UX 11i, a savings of \$33,964 in initial labor, porting and recompilation, and services and retirement costs. Specifically, HP helps reduce the project planning labor and service costs via

complimentary and included project management services, and reduced recompilation costs via run time compatibility. The comparison indicates a 58% savings for HP-UX 11i in change costs versus IBM AIX.

Change Costs	IBM AIX	HP-UX 11i	Savings with HP-UX 11i
Project cost - labor	\$12,650	\$6,712	\$5,938
Project cost - services	\$33,000	\$18,000	\$15,000
Application porting / recompilation	\$13,026	\$0	\$13,026
Total (5-year)	\$58,676	\$24,712	\$33,964

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 to 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 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

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 change costs are 20% less than the specified IBM solution.

	IBM	HP-UX 11i	Savings with HP-UX 11i
Business value of application per week	\$5,769,288	\$5,769,288	
Time to deploy (weeks)	5	4	
Total business value during deployment	\$28,846,440	\$23,077,152	\$5,769,288
Average profit margin	15.00%	15.00%	
Total margin value during deployment	\$4,326,966	\$3,461,573	\$865,393

Business Agility

In addition to the lower TCO provided by HP-UX 11i, a business benefit is also realized when companies are more responsive and able to adapt to changing business needs. HP-UX 11i provides an estimated annual strategic business benefit of \$900,000 in incremental margin contribution for the specified scenario.

	IBM	HP-UX 11i	Benefits with HP-UX 11i
Average annual revenue or budget	\$750,000,000	\$750,000,000	
Percentage of revenue attributable to application	40.0%	40.0%	
Revenue improvement in revenue	\$300,000,000	\$300,000,000	
Potential improvement in revenue	1.0%	3.0%	
Potential improvement in revenue	\$3,000,000	\$9,000,000	\$6,000,000
Average profit margin	15.0%	15.0%	
Potential improvement in margin	\$450,000	\$1,350,000	\$900,000

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 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

Although it is difficult to quantify the value of an agile and future-proof platform selection, it is quite probable that the server hardware, applications, and operating system originally specified will not be adequate in the near future. 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 adaptable enterprise.

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 p690 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.

Consolidation and Future Proofing Features	HP Virtual Server Environment for HP-UX 11i on Superdome	IBM AIX on p690
Resource management	Yes	Yes
Goal-based workload management	Yes	No
Software-based partitioning	Yes (up to 128 partitions on PA-8800 Superdome)	Yes (up to 32 logical partitions)
Hardware-partitioning (electrical isolation)	Yes (up to 16 hard partitions)	No
HA clustering integrated with server virtualization	Yes	No
Instant turn on CPUs (Instant Capacity)	Yes	Yes
Temporary enable/disable of CPUs on demand (Temporary Instant Capacity)	Yes	Yes
Memory on demand	Yes	Yes
Pay based on metered usage (PPU)	Yes	No

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.

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 operating systems and server platforms for hosting mission critical applications and aiding efforts to reduce data center costs. By analyzing the total cost of ownership, the lifecycle 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 Superdome servers presents several compelling TCO and business advantages over the competitive proprietary UNIX solution, IBM AIX running on the IBM p690 . When hosting, migrating, or consolidating UNIX applications, proprietary RISC based UNIX platforms such as IBM AIX with p-series has a 12% higher total cost of ownership than comparable HP-UX 11i with Integrity server (Itanium® based) deployments. The cost savings with HP include better cost / performance, reduced support costs, reduced facilities costs, and lower change 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. 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 p-series solutions from IBM. When these additional indirect benefits are considered, the total savings are 14% or more for HP-UX 11i over the comparable IBM AIX solution.

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>