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White Paper

Hitachi Unified Compute Platform (UCP) Economics Justification Evaluation

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Executive Summary

Hitachi Data Systems commissioned Edison Group, Inc. to conduct a Hitachi Unified Compute Platform (UCP) economics study to evaluate the total cost of ownership (TCO) and total cost of acquisition (TCA) that could be realized from migrating self-build deployments, including both virtual and bare-metal solutions to UCP converged infrastructure. The aim of this study is to demonstrate tangible and important cost savings in moving to UCP around operational efficiency that allow customers to deliver scalable and efficient infrastructure to meet business needs.

In order to understand the full impact of moving to UCP, Edison interviewed an existing HDS customer that had transitioned to UCP from self-build or do-it-yourself (DIY) infrastructure. The interviews examined in detail the operational processes involved in delivering IT services to the customer, in this instance a mix of internal and external clients operating on shared infrastructure.

Edison combined customer data, Edison intellectual property on converged infrastructure (specifically from previous work with EMC's VCE solutions [1]) and collateral from Hitachi Data Systems' IT Economics practice to produce a financial model comparing the TCO and TCA achieved from deploying an UCP solution with reference to both DIY and VCE. These figures where translated into costs per virtual machine, based on customer data.

Analysis of the results show a TCA of a customer modeled DIY solution to be $4,844,293[2], compared to VCE at $4,621,701 and to UCP at $3,031,730. This represents a 37.4% savings for UCP over the DIY option. Calculating TCO for a 5-year period results in costs for DIY at $16,012,552, VCE at $12,244,515 and UCP at $9,902,899. TCO includes hardware and software acquisition costs, plus operational management and environmental overheads. The results show the UCP solution delivered a 38.1% savings in TCO over the DIY option.

UCP delivers a consistently lower solution cost, due to unique advantages in Hitachi hardware and software. Hitachi Unified Compute Platform Director (UCP Director) automates the end-to-end management and orchestration of both physical and virtual resources, reducing build, deployment and provisioning time. Specific hardware features, including unique Hitachi server LPARs and SMP capability and Hitachi storage virtualization, dynamic pooling and tiering, provide resource efficiency and resiliency, compared to other solutions available.

[1] Note that VCE is now an EMC subsidiary and has been renamed as EMC Converged Platforms Division

2 All figures are in US dollars

Data Center Challenges

Virtualization Challenges

The adoption of server virtualization technology in the early 2000s changed the application deployment landscape. IT consumers moved from an environment with many disparate platforms (including Sun SPARC, HP-UX and other proprietary chipsets) to standardize on the x86 platform. Virtualization brought in abstraction, removing the need to understand the hardware platform underlying each operating system deployment. The result was the ability to implement massive consolidation in hardware and to drive higher efficiencies in the use of physical technology.

However, despite the positives of virtualization, large enterprises were still dealing with an infrastructure operating framework based around towers of technology (server & O/S, networking, storage) and the division of teams into Plan, Build, Operate & Decommission roles. This "stove piping" of skills created artificial borders between teams that did not scale, but rather resulted in the lack of cross-discipline understanding (storage teams not understanding server virtualization requirements being one obvious example). The ultimate result is too much cross-discipline "traffic" and poor or even flawed designs for infrastructure deployments resulting in high levels of complexity that cut agility and increased cost.

Delivering a Service

One of the problems experienced by many organizations is the transition to delivering technology as a service to their internal customers, rather than on a project basis. In many cases, IT departments still continue to fund new technology on the basis of projects, such as the introduction of a new application. Rather than call upon resources from central IT, budget is used to acquire physical equipment (servers, storage, O/S) with the notion that this hardware belongs to the owner of the project. This methodology creates significant issues further down the line, when IT standards dictate that a hardware refresh is required and no-one steps forward to fund it; the original project team have moved on, or are satisfied with the operation of the current technology and so an IT "central fund" comes into play, which makes planning and forecasting difficult.

Bespoke Engineering

Before server virtualization was fully established, most IT organizations focused on a number of hardware architectures and associated operating systems. The need to keep up to date put significant

pressure on engineering teams to stay current with the latest hardware releases, upgrades and patches and turn these into operationally deployable solutions, effectively creating bespoke engineered solutions. Engineering teams still working with this traditional model of operation are in a constant cycle of certification and testing for new hardware, building and maintaining interoperability matrices to track all of the hardware deployed in their environment. This challenge is a thankless task, made worse when there are no policies in place for technology refresh; ageing servers and applications can hold up the decommissioning of associated hardware (like storage) and result in huge costs for extended maintenance and support.

Ultimately, having either a lack of policies or different refresh cycles for each component in the data center, results in significant issues in managing scalability and the ability of a single FTE (full-time employee) to manage large parts of the infrastructure. Contrast this to the levels of scalability achieved by web-scale companies at the opposite end of the spectrum, such as Google, Facebook, and Microsoft where they have relatively few infrastructure FTEs.

Organizational Change

Economic Realities

In addition to all of the technical and operational challenges, there are economic realities to consider. Rarely do budgets increase, instead companies are always looking for ways to increase the efficiency of their IT organizations and hold or reduce costs. Budgets simply remain flat (or decrease) while the volume of data, applications and systems increase. IT organizations will re-organize based on new priorities, changes of leadership or as the result of mergers and acquisitions, all of which have the potential to disrupt the deployment of technology.

Of course hardware acquisition is only a part of the cost of delivering IT services. The equipment has to be housed in data centers, with associated space, power, and cooling costs. Virtualization has helped to reduce this burden; however, with many companies seeing data growing at anywhere from 50-100 percent per annum, any savings is welcomed. Some 80 percent of costs in IT come from operational expenditures – the process of delivering IT. Although this figure may seem high, it is not unexpected, with the savings that have been made through standardization and consolidation (via virtualization). Operational expenditure is now under the spotlight as a way to reduce overall IT costs.

Changing Roles

IT itself is expected to change and be more adaptable to business needs. There's an increasing desire to reduce time to market for new applications, many of which are mobile and web-focused. This agility is being delivered through new processes such as "DevOps", the bringing together of development and operational teams to enable rapid application deployment. However, at the same time we should not forget that despite the need for new ways of interfacing with customers, mission-critical applications are still of the utmost importance as they form the core of the application ecosystem. These applications demand stability and isolation – protection from the risks of being exposed to cyber attacks and hackers looking to exploit corporate assets for illegal gains.

Looking to the Future

Many IT organizations have looked to develop their own methodologies for the design and deployment of technology blueprints. These "DIY" solutions require teams of architects to evaluate, analyze and constantly review the technology available in the marketplace. Components from server, storage, network and O/S have to be integrated in a process that ultimately is not scalable and does not enable rapid technology deployment.

Converged infrastructure seeks to resolve the operational and technical issues by providing the customer with solutions that are pre-tested, packaged and supported by a single vendor. Second generation platforms such as Hitachi Unified Compute Platform (UCP) provide new benefits around end-to-end automation and hardware features that reduce unit costs when measured against today's preferred application container, the virtual machine (VM).

Risk and Feature Analysis

Moving to a converged system allows many of the repeated tasks in designing and deploying infrastructure to be simplified. Anecdotally, we expect to see savings in the "plan" and "deploy" times, by using pre-tested vendor designs that remove the need to go through lengthy selection and evaluation processes and the subsequent certification testing and design.

Converged solutions provide customers with much more background information on the expected workload capabilities of the infrastructure, whether for running general virtual server workloads or for specific applications such as SAP Business Suite, Oracle database and Microsoft Exchange, as vendors have done much of this work up front. This means that systems can be sized on application-based metrics such as number of VMs per system or transactions processed per minute. Ultimately, using a converged infrastructure is about becoming more agile and enabling faster time to market for the business. This includes being able to commission and deploy infrastructure in a much shorter timescale than would be required in traditional environments.

Hitachi Unified Compute Platform (UCP) Feature Analysis

In making the comparisons, Hitachi clients highlighted features of UCP platform that provided specific benefits. These included:

- **Bare metal provisioning** – UCP was able to manage the provisioning of physical servers into the infrastructure, as well as the appropriate software platform (e.g. the hypervisor).
- **Automation** – UCP provided a high degree of automation for repeated and frequent tasks, freeing up administrators'' time to work on value-add projects.
- **End-to-end Orchestration** – UCP manages all parts of the configuration from storage, networking to deploying the hypervisor onto bare metal and the creation of virtual machines.
- **Certified Solutions** – UCP provides tested and pre-engineered solutions, including popular business applications.
- **Multi-tenancy** – UCP supports multiple hypervisors and native LPARs (logical partitioning) on X86 blade servers.
- **Scalability** – UCP supports SMP (Symmetric Multi-Processing), which is the ability to combine multiple physical servers/blades into a single logical server instance/node.
- **Storage Flexibility** – UCP includes support for mixed storage workloads on file and block devices.

- **Storage Efficiency –** UCP systems based on Hitachi VSP or HUS storage platforms provided high levels of performance for the amount of storage deployed. HDS systems provided the capability to deploy NAND flash technology within the same hardware chassis, using existing management tools and platform features.

Total Cost of Ownership Analysis

Edison has taken data from multiple sources including previous VCE Vblock analysis, workshops and interviews (including a customer) and integrated this with the hard costs in delivering converged (UCP and Vblock) and DIY solutions. This data has been extrapolated into a five-year growth projection, using standard growth figures from the customer. The results are then translated into a cost-per-VM (virtual machine) figure that allows the comparison of costs between configurations at the virtual machine level.

Cost per VM, rather than overall system cost is used as the direct measure as this provides a more real-world cost structure that can be used within the IT organization as part of billing/chargeback. One of the key tenets of Hitachi Data Systems' IT Economics model is the ability to fully quantify the costs of delivering IT as a service. It examines all aspects of the infrastructure delivery process, using a comprehensive range of cost categories, in order to calculate an accurate and detailed TCO. The Edison model in this paper is therefore based on and uses the same IT Economics principles. Customers using the IT Economics service can see a direct benefit from migrating to UCP, expressed in terms that can be easily related to the service offering charged to the customer, namely the virtual machine.

Customer Background

Edison conducted an interview with a leading global provider of SAP solutions, who is currently using UCP for VMware vSphere to deliver services to global customers across a range of industries including retail, manufacturing, energy, industrial, transportation and information technology.

The customer runs multiple UCP platforms, based on Hitachi Unified Compute Platform 4000E for VMware vSphere and Hitachi Unified Compute Platform 4000 for VMware vSphere. The platforms support hundreds of virtual machines based on traditional workloads including SAP, Oracle and Microsoft SQL Server, with a range of VM configurations from very large (64GB vRAM and 10TB storage) to smaller systems (less than 1GB vRAM and 20GB of storage). The average configuration is approximately 400GB storage per VM and 10GB vRAM. VMs are also used to support maintenance efforts for patching and new installations (e.g. jumphosts).

Prior to the migration to UCP, the customer ran services out of bespoke self-built infrastructure solutions. The interview process provided the ability to understand the capital and operational savings achieved in standardizing on UCP platform.

Capital Expenditure Breakdown

Capital expenditure includes the cost of hardware (either as separate components or as a converged configuration), plus software licenses, including software required to deploy and manage the converged infrastructure. The data presented shows the DIY and UCP costs based on customer data, plus the costs for VCE derived from previous Edison research.

Solution	Component	Year 1	Year 2	Year 3	Year 4	Year 5
		USD ($)				
DIY	Hardware	$1,382,294	$311,016	$380,995	$466,719	$571,730
DIY	Licenses	738,331	175,354	217,000	268,538	332,315
DIY	**Total**	**$2,120,625**	**$486,370**	**$597,995**	**$735,257**	**$904,045**
VCE Vblock	Hardware	$1,402,404	$315,541	$386,538	$473,508	$580,048
VCE Vblock	Licenses	624,109	148,226	183,429	226,994	280,905
VCE Vblock	**Total**	**$2,026,513**	**$463,767**	**$569,967**	**$700,502**	**$860,953**
Hitachi Unified Compute Platform (UCP)	Hardware	$837,475	$188,431	$230,829	$282,766	$346,388
UCP	Licenses	488,589	116,040	143,599	177,704	219,909
UCP	**Total**	**$1,326,064**	**$304,471**	**$374,428**	**$460,470**	**$566,297**

Table 1 - Capital Expenditure Breakdown

The tables and figures show that the VCE Vblock solution was marginally more expensive in hardware terms ($580K to $571K) but less expensive in licensing ($281K to $332K) when compared to the DIY solution. The UCP solution was less expensive for both hardware and licensing than the DIY and VCE solutions. All three solutions support the same volume of application workload. Savings compared to Vblock are shown in "Table 2 - Capital Expenditure Savings". Costs savings were achieved because the UCP solution required fewer hardware resources to support the application workload of the customer.

Savings Comparison	Year 1	Year 2	Year 3	Year 4	Year 5
	USD ($)				
Hitachi Unified Compute Platform (UCP) –DIY	**$794,561**	**$181,899**	**$223,567**	**$274,787**	**$337,748**
UCP-VCE Vblock	**$700,449**	**$159,296**	**$195,539**	**$240,032**	**$294,656**

Table 2 - Capital Expenditure Savings

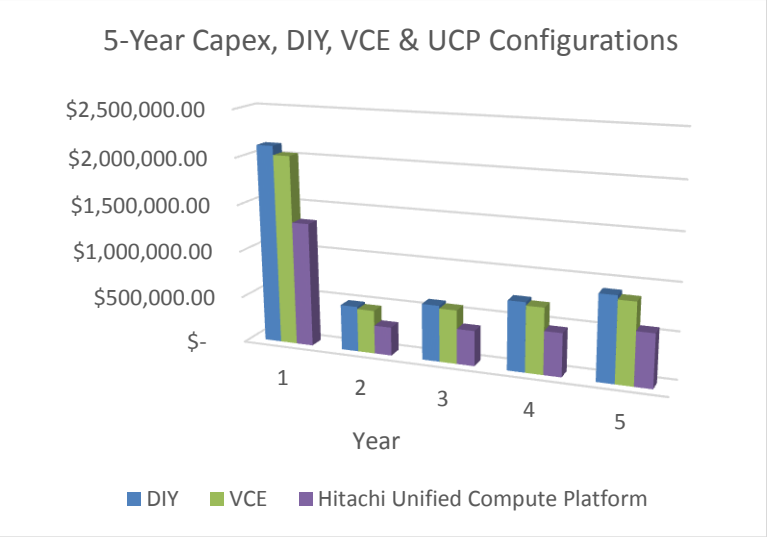

Figure 1 - Five Year Capex (DIY, VCE, UCP)

In "Figure 1", the data shows the information from "Table 1" in graphical form, highlighting the lower cost of UCP compared to both VCE and DIY over the 5-year period.

Operational Savings (Personnel & Environmental)

Personnel operational savings were based on interviews with the same service provider and UCP customer mentioned earlier. The interviews discussed the effort involved in completing common tasks within the infrastructure environment. The data collected was mapped to standard ITIL process definitions and shows the savings in typical design, deployment and operation tasks for UCP compared to a DIY solution. Figures for VCE were taken from previous Edison research.

Metric	Derivation	Saving
Design: Technology Research	Customer	59.1%
Design: Technology Design	Customer	59.1%
Design: Documentation	Customer	0.0%
Transition: Planning	Customer	33.3%
Transition: Deployment	Customer	40.0%
Transition: Asset Management	Customer	33.3%
Transition: Service Integration	Customer	50.0%
Transition: Capacity Management	Customer	50.0%
Transition: Maintenance	Customer	50.0%
Operation: Service Requests	Customer	43.8%
Operation: Event Management	Customer	46.2%
Operation: Incident Management	Customer	60.0%
Operation: Training	Customer	50.0%

Table 3 - Operational Efficiencies Savings

Migration to UCP realized significant savings in Service Design, Transition and Operations. The greatest savings in Service Design were made in research and design of storage, servers and tools[3] components. Service Transition saw significant savings in the management of upgrades and capacity planning. Service Operation experienced significant savings in time expended on incident management (fault diagnosis) and networking configuration.

These savings are achieved because:

- UCP either removes or significantly reduces the repetitive operational tasks (such as provisioning and mapping LUNs) the customer needs to perform.
- Research and design is reduced because the vendor has already done the work in validating and certifying the components of the solution will work with each other.
- Deployment is simplified because the solutions are typically packaged and shipped as a single rack, simply requiring power and networking.

[3] In this instance, tools refer to software products used to orchestrate and manage infrastructure, e.g. UCP Director

- Operational tasks were considerably reduced because the UCP software, UCP Director, manages the details of deploying and configuring bare metal, hypervisors and virtual machines.
- Significant saving around the incident and event management tasks. Pre-certification and testing greatly reduces the issues seen by customers.

Translating these efficiencies into financial savings, the overall improvements in managing the infrastructure sees a reduction in FTE count of 2.388 and a cost avoidance of 43.44 percent or $4,183,781 over five years. Comparisons of UCP to both the DIY and VCE configurations are contained in the following two tables.

Solution	FTE	Year 1	Year 2	Year 3	Year 4	Year 5
		USD ($)				
DIY	5.436	$1,428,360	$1,642,614	$1,889,006	$2,172,357	$2,498,211
Hitachi Unified Compute Platform (UCP)	3.048	807,840	929,016	1,068,368	1,228,624	1,412,917
Savings	**2.388**	**$620,520**	**$713,598**	**$820,638**	**$943,733**	**$1,085,294**
%		**43.44%**	**43.44%**	**43.44%**	**43.44%**	**43.44%**

Table 4 - Personnel Savings (DIY & UCP)

Solution	FTE	Year 1	Year 2	Year 3	Year 4	Year 5
		USD ($)				
VCE Vblock	3.288	$882,480	$1,014,852	$1,167,080	$1,342,142	$1,543,463
Hitachi Unified Compute Platform (UCP)	3.048	807,840	929,016	1,068,368	1,228,624	1,412,917
Savings	**0.24**	**$74,640**	**$85,836**	**$98,711**	**$113,518**	**$130,546**
%		**8.46%**	**8.46%**	**8.46%**	**8.46%**	**8.46%**

Table 5 - Personnel Savings (VCE & UCP)

The improvements seen in this analysis were realized through the benefits of UCP Director, which provides end-to-end management of both virtual and physical resources in the UCP solution infrastructure. Even when compared to VCE, UCP figures show additional savings, highlighting the benefits of the unique features of UCP Director compared to other converged offerings.

UCP Director enables customers to reduce the time spent on deploying and managing infrastructure, while also reducing the effort involved in provisioning resources to end users. This includes, for

example, the automated provisioning of storage assigned to physical LPARs, hypervisors, and virtual servers. There is no requirement to deploy team members with dedicated storage, networking and server skills; resources can be deployed by skilled generalists. This has enabled the customer to reduce headcount in the support team by 43%. These staff members can be deployed usefully elsewhere. Incident Management tasks were significantly reduced due to the native integration of UCP Director into vSphere vCenter, providing a single reference point for managing physical resources.

In the interview conducted by Edison with the customer deploying SAP solutions, typical growth for each line of business was between 100-500GB/month where SAP was deployed and around 500GB/month using traditional applications including file servers. This growth is managed using UCP Director to provision additional storage capacity. The use of UCP Director, with native support in vSphere for storage resources has allowed the customer to achieve an almost 44% reduction in service requests and 50% reduction in time spent on capacity planning compared to using the separate tools in a DIY environment.

Other operational expenditure not relating to personnel includes hardware and software maintenance charges as quoted by each vendor in the comparison. Facilities charges include an estimate of power, cooling and space each solution. Power figures are either provided by the vendor or calculated from publicly available tools and represent the maximum power requirement. Operations costs are consolidated from "Table 4 - Personnel Savings (DIY & UCP)" and "Table 5 - Personnel Savings (VCE & UCP)". These figures show year 1 costs for initial maintenance and subsequent maintenance costs representing the incremental increase in hardware and software license capacity to manage growth. "Table 6 - Five Year Operational Expenditure Comparisons" provides an overview of opex costs and savings. A breakdown of the figures for DIY, VCE and UCP can be found in the Appendix.

Solution	Year 1	Year 2	Year 3	Year 4	Year 5
	USD ($)				
DIY	**$1,957,928**	**$1,890,162**	**$2,090,633**	**$2,422,057**	**$2,807,479**
VCE	**1,506,160**	**1,199,911**	**1,396,189**	**1,625,818**	**1,894,735**
Hitachi Unified Compute Platform (UCP)	**1,295,952**	**1,093,691**	**1,272,577**	**1,481,889**	**1,727,059**
Saving (UCP-DIY)	**$661,976**	**$796,471**	**$818,056**	**$940,168**	**$1,080,420**
Saving (UCP-VCE)	**$210,208**	**$106,220**	**$123,612**	**$143,929**	**$167,676**

Table 6 - Five Year Operational Expenditure Comparisons

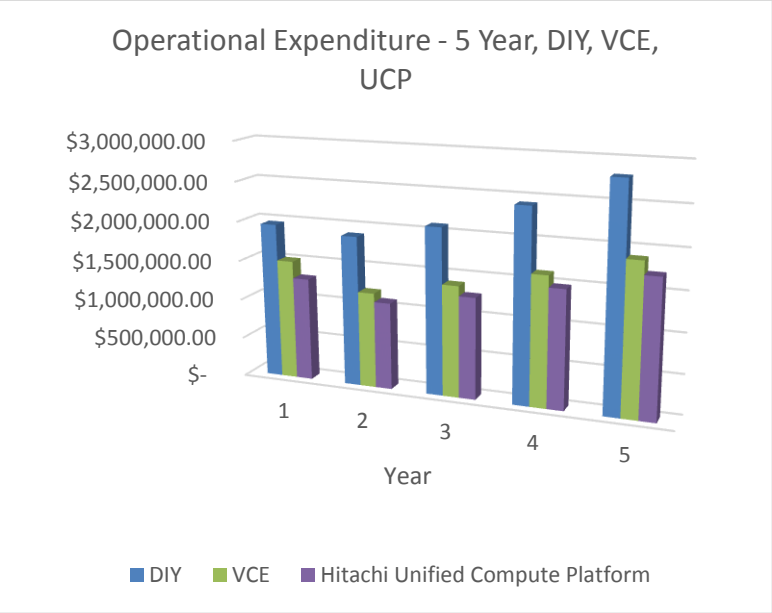

Figure 2 - Five Year Opex (DIY, VCE, UCP)

"Figure 2" shows the data from "Table 6" in graphical form, demonstrating the opex efficiency of the UCP solution compared to both DIY and VCE options.

Total Cost of Ownership and Acquisition over Five Years

Figure 3 shows total cost of acquisition (TCA) for each solution over a 5-year period, assuming a CAGR (compound annual growth rate) of 25 percent as DIY - $4,844,293, VCE - $4,621,701 and UCP - $3,031,730.

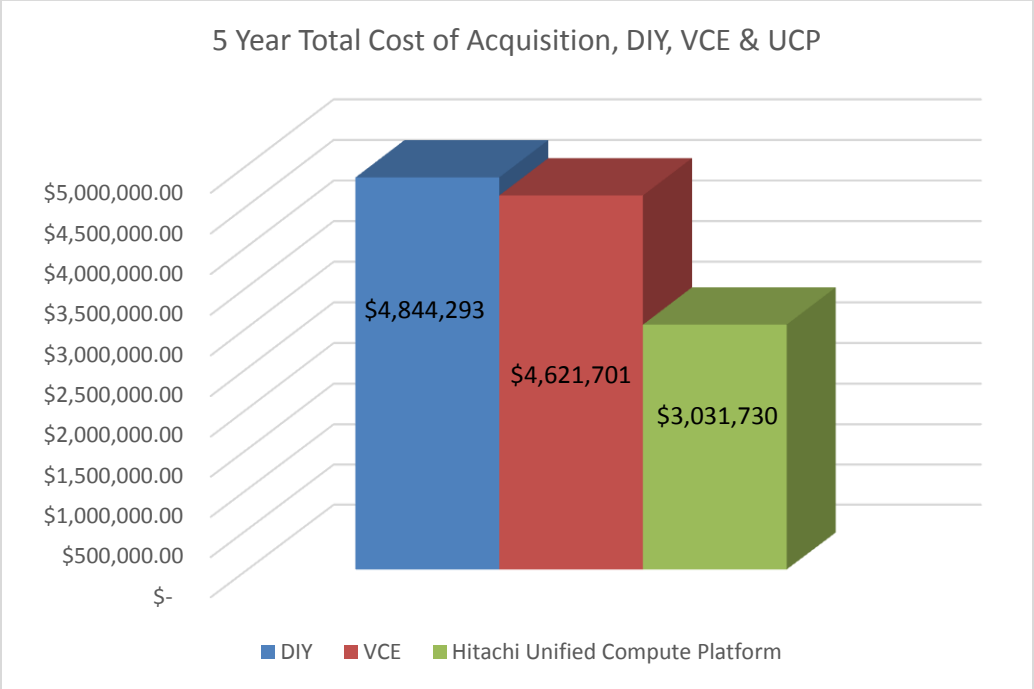

Figure 3 - Five Year Total Cost of Acquisition (DIY, VCE, UCP)

Calculating TCO for a 5-year period shows DIY - $16,012,552, VCE - $12,244,515 and UCP - $9,902,899. These figures are broken down by capex and opex values as shown in the following chart.

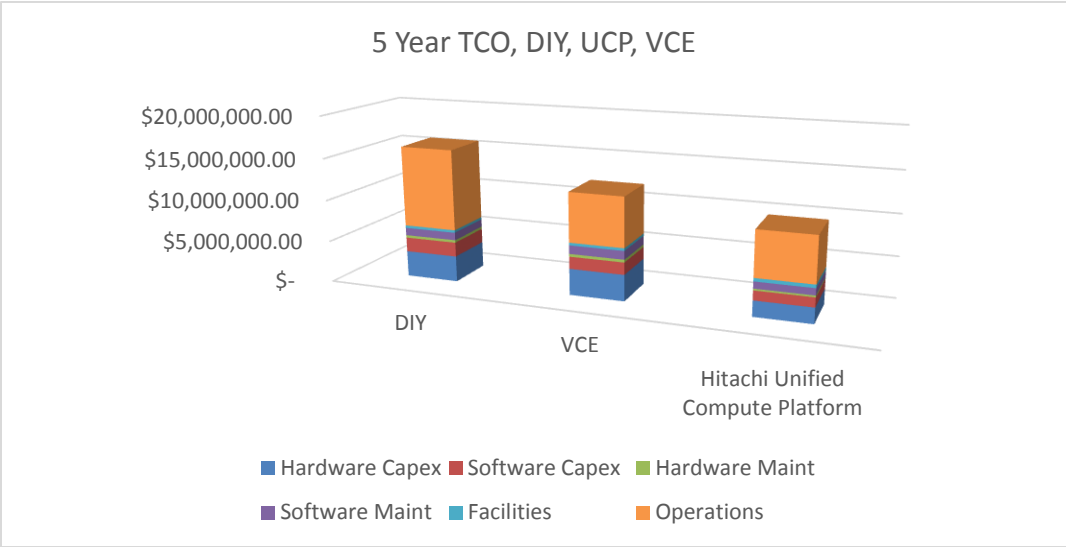

Figure 4 - Five Year Total Cost of Ownership (DIY, VCE, UCP)

The details in Figure 4 show the UCP solution is competitive in each of the six capital and operational expenditure areas, except for facilities. In this instance, UCP showed a higher figure ($49K compared to $38K in year one) than the other solutions; however, these values were taken from vendor quoted maximum power consumption, rather than actual measurements and so may be conservatively

specified. Further breakdown of the TCO figures are shown as pie charts in the Appendix, providing detail on how each cost adds to the total TCO figure.

TCO – VM

Combined capital and operational expenditure shows a UCP cost reduction of 35.71 percent from DIY and 25.78 percent from VCE per VM in year 1. This extrapolates over a 5-year period as shown in Table 7 and in Figure 5, representing the cost per VM per month. Figures for years 2 to 5 show the incremental cost of virtual machines deployed to cater for growth. The overall cost drops sharply as the capital cost is catered for in year 1.

Solution	Year 1	Year 2	Year 3	Year 4	Year 5	Average
	USD ($)					
DIY	$1,000	$245	$154	$113	$87	$219
VCE	866	172	113	83	65	167
Hitachi Unified Compute Platform (UCP)	643	144	95	69	54	135
% Saving (UCP-DIY)	**35.71%**	**41.17%**	**38.74%**	**38.48%**	**38.21%**	**38.16%**
% Saving (UCP-VCE)	**13.38%**	**30.00%**	**26.87%**	**26.32%**	**25.75%**	**23.53%**

Table 7 - Cost Efficiency per VM

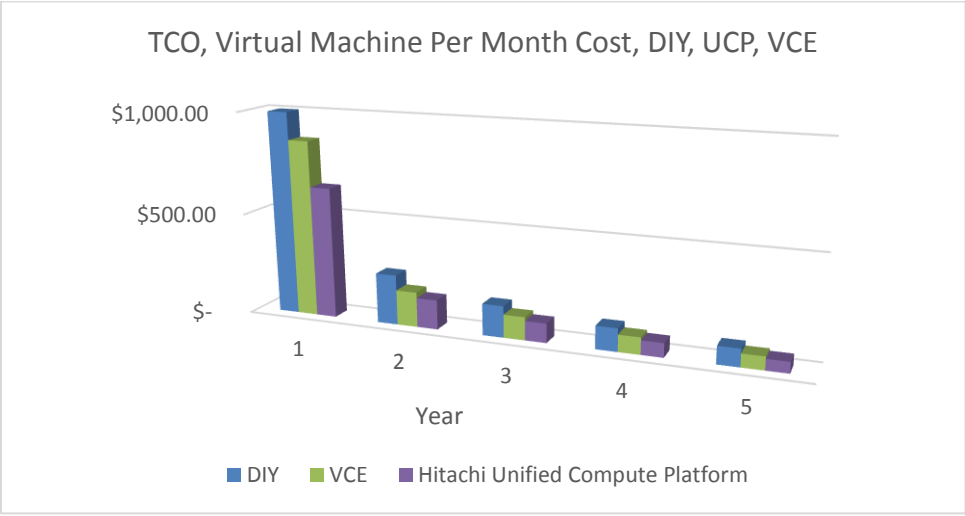

Figure 5 - Total Monthly Cost of Ownership per VM (DIY, UCP, VCE)

Conclusion and Recommendations

Converged infrastructure provides the opportunity for significant savings in the operational overhead in deploying IT infrastructure. These systems remove much of the operational burden in researching and designing complex IT systems used to deliver private cloud infrastructure.

Innovative solutions such as Hitachi Unified Compute Platform provide additional benefits in the day-to-day consumption of IT resources, by providing automation and management tools that improve the efficiency of configuring, provisioning and consuming IT resources through virtual machines and bare-metal servers. UCP combines these software features with the benefits of Hitachi storage and Hitachi blades to deliver an integrated end-to-end solution.

This study examined the potential savings to be made through moving to UCP as experienced by an existing HDS customer. Through the process of interviews, workshops and other research, Edison has shown how this customer was able to make large reductions in the previous operational overhead involved in delivering their IT systems to customers. This saving translates into a direct benefit for the customer as well as enabling this HDS customer to be more competitive with their clients.

Over a five-year period for UCP versus DIY:

- Capital costs were reduced by 37 percent, saving over $1.8Million.
- Operational costs were reduced by 38 percent, saving over $11.1Million.

Also, over a five-year period for UCP versus VCE:

- Capital costs were reduced by 34 percent, saving almost $1.6Million.
- Operational costs were reduced by 10 percent, saving over $751Thousand.

When examining the cost per VM (a key metric for charging customers in private cloud deployments) savings for UCP over DIY averaged over 38 percent and over 19 percent over VCE.

Appendix

Research Methodology

Edison uses a combination of internally developed methodologies, including knowledge from working with enterprise customers and experience in the field delivering IT services. This is combined with data, collateral and experience from previous client engagements. Where appropriate, Edison performs interviews and runs workshops in order to gather real-world operational data that is used to substantiate the assessments and analysis work.

In this study, Edison worked with HDS to understand the design goals of Hitachi Unified Compute Platform and with Hitachi's team responsible for developing IT Economics, an HDS methodology used to calculate the TCO and ROI on deploying and operating IT infrastructure. Edison used the principles of IT Economics to develop a financial model that compares the UCP converged infrastructure with a self-build/DIY as well as a VCE configuration. The results of the comparison are used to extrapolate the savings from migrating to UCP over a five-year period. The objectives and approach included:

- Interviews with HDS marketing and technical staff to identify and gather information relating to the benefits of UCP technology.
- Reviews of existing HDS marketing collateral and case studies.
- Analysis of the HDS IT Economics methodology, including internal service delivery documentation and previous customer assessments.
- Interviews with HDS customers to identify and evaluate savings (capital and operational) from moving to UCP.
- Development of a financial model to quantify the savings from UCP compared to DIY and competitive solutions. This included adjusting some metrics based on the review of existing Edison IP relating to converged infrastructure.

Disclosure

- This study was commissioned by HDS and was written and produced by Edison Group, Inc. The report is intended to provide the reader with information on the metrics that should be considered in evaluating a move to converged infrastructure and is not meant to be used as a direct competitive analysis.
- Edison uses information derived from previous research and interviews in good faith, validating savings claims by customers to the fullest practical extent, however no guarantees are made on the

potential savings other organizations may realize and readers should use their own operational estimates when calculating likely returns on investment.

- HDS facilitated the introductions to customers for the production of this report, but did not take part in the interview process.
- Edison maintains editorial control in the production of this report, with input from HDS used only to ensure technical accuracy of the claims and savings made.
- All financial figures are presented rounded to the nearest dollar.

Evaluation Baseline

The Edison analysis follows a methodology that divides the delivery of technology into hard and soft costs. Hard costs are a mixture of capital and operational expenditure and include:

- Hardware acquisition (purchased, leased or on-demand)
- Software licenses
- Hardware and software maintenance
- Staff costs
- Environmental costs (power, cooling, space)

Soft costs are part of those included in staff costs, but dig into the operational requirements to deliver the IT service. Typically, these are based on an ITIL framework that includes Service Design (designing and architecting technology solutions), Service Transition (deploying and decommissioning services) and Service Operation (operating and consuming technology resources).

- Service Design
  - Research (storage, networking, servers, tools)
  - Design (storage, networking, servers, tools, solutions integration)
  - Documentation and collateral (blueprints, user and deployment guides)
- Service Transition
  - Transition Planning
  - Deployment and Configuration
  - Integration and testing
  - Capacity upgrades (server/storage/networking)
  - Maintenance (patching, code upgrades)

- Service Operations
  - Service requests (deployment/provisioning/decommission)
  - Event management (monitoring, capacity planning, performance management)
  - Incident management
  - Overheads (training & staff development)

Within each of these areas, Edison established a baseline for the delivery of services. In evaluating converged infrastructure, this consists of comparing self-build or "build-your-own" solutions, compared to the features offered by converged infrastructure.

Hard costs are fairly simple to establish, using a consistent service requirement. As part of this report, Edison interviewed an HDS customer that had migrated from DIY solutions to one based on UCP. Workshops and interviews were performed and used to collate information on the proportion of time and effort assigned to each service task (Design, Transition, Operations), before and after the converged infrastructure was implemented. This process highlighted operational savings achieved through the use of converged infrastructure in each of the categories previously documented. In practice the level of detail recorded was greater than highlighted above. For the purposes of confidentiality, specific details of clients are not included in this report, other than to say that the client chosen represented a range of business applications. From a hardware perspective, the customer environments were used to build out a DIY, UCP and VCE configuration based on the workload supported by the customer.

Infrastructure Assumptions

Capital cost comparisons in this model have been made on the basis of comparing the cost of deployment of a UCP, VCE and self-build configuration. The specification of both designs is based on the technology deployed by the customer, in order to provide a credible TCO calculation. Edison provided specifications to HDS to deliver a UCP configuration, while the self-build and VCE options were costed out by Edison directly. The DIY solution was based on equivalent technology to that used in UCP and included Cisco UCS blade servers, networking and EMC storage. Costs included licensing appropriate to the hardware platform, based on VMware vSphere 5.5.

Technology configurations were used to derive environmental costs for data centre space, power and cooling based on typical industry-standard figures used within Hitachi Data Systems' IT Economics model.

Additional Data

The following three tables show the 5-year operational expenditure for each solution.

Solution	Component	Year 1	Year 2	Year 3	Year 4	Year 5
		USD ($)				
DIY	H/W Maint	$138,475	$31,157	$38,167	$46,755	$57,275
DIY	S/W Maint	352,701	168,485	103,661	128,280	158,747
DIY	Facilities	38,392	47,906	59,799	74,665	93,247
DIY	Operations	1,428,360	1,642,614	1,889,006	2,172,357	2,498,210
DIY	**Total**	**$1,957,928**	**$1,890,162**	**$2,090,633**	**$2,422,057**	**$2,807,479**

Table 8 - Five Year Operational Expenditure - DIY

Solution	Component	Year 1	Year 2	Year 3	Year 4	Year 5
		USD ($)				
Hitachi Unified Compute Platform (UCP)	H/W Maint	$93,044	$20,935	$25,645	$31,415	$38,484
UCP	S/W Maint	345,691	82,102	101,601	125,731	155,592
UCP	Facilities	49,377	61,638	76,963	96,120	120,066
UCP	Operations	807,840	929,016	1,068,368	1,228,623	1,412,917
UCP	**Total**	**$1,295,952**	**$1,093,691**	**$1,272,577**	**$1,481,889**	**$1,727,059**

Table 9 - Five Year Operational Expenditure – UCP

Solution	Component	Year 1	Year 2	Year 3	Year 4	Year 5
		USD ($)				
VCE	H/W Maint	$148,213	$33,348	$40,851	$50,043	$61,302
VCE	S/W Maint	437,075	103,805	128,459	158,968	196,723
VCE	Facilities	38,392	47,906	59,799	74,665	93,247
VCE	Operations	882,480	1,014,852	1,167,080	1,342,142	1,543,463
VCE	**Total**	**$1,506,160**	**$1,199,911**	**$1,396,189**	**$1,625,818**	**$1,894,735**

Table 10 - Five Year Operational Expenditure - VCE

Cost breakdown figures for DIY, VCE and UCP are also shown in the following charts:

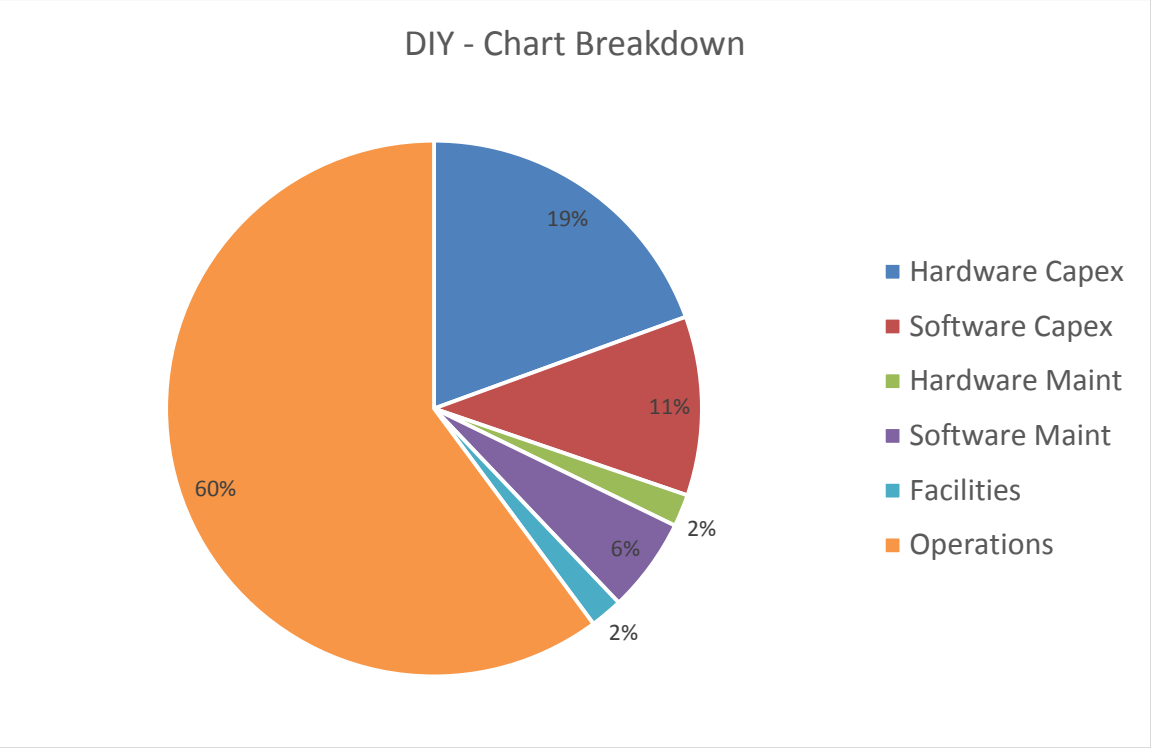

Figure 6 - DIY Cost Breakdown

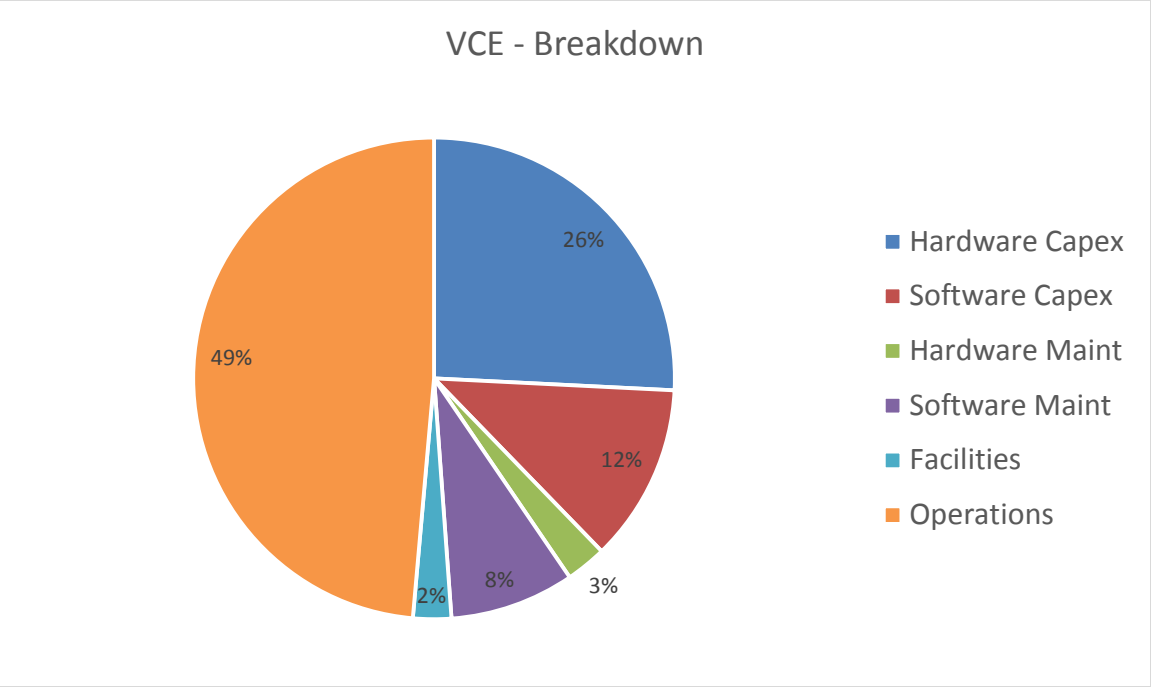

Figure 7 - VCE Cost Breakdown

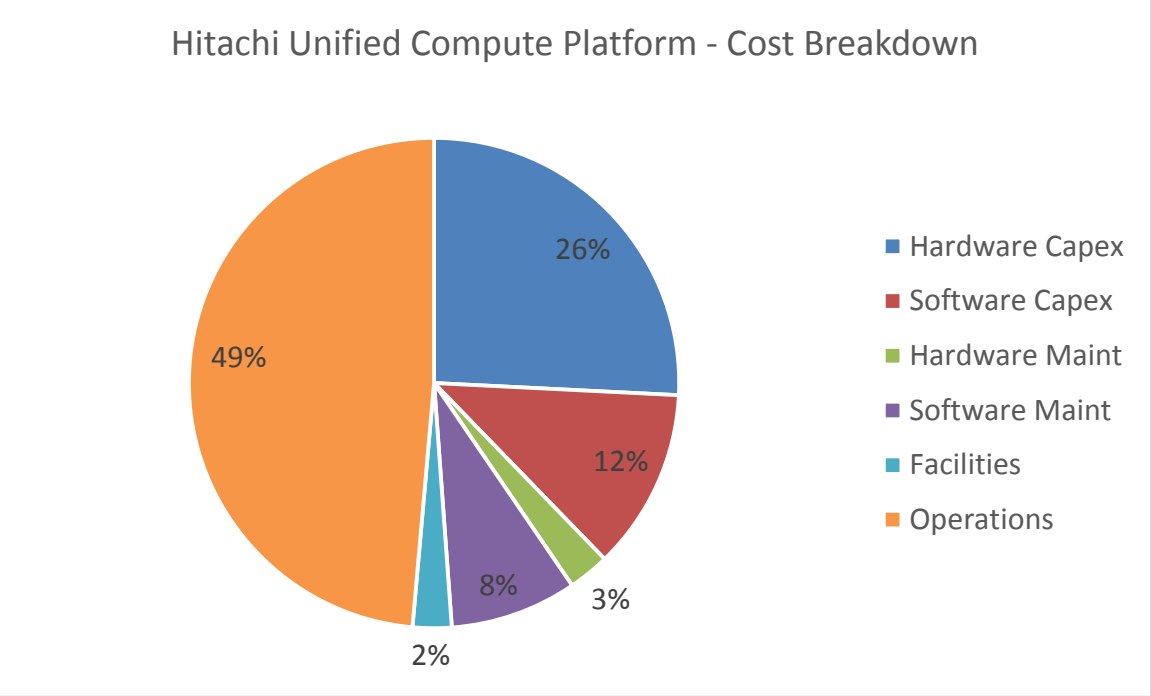

Figure 8 –UCP Cost Breakdown

Calculation Assumptions

The following assumptions were made when evaluating the solutions in this report.

- Compound annual growth of applications is 25%
- Hardware price erosion is 10% per annum
- Software price erosion is 5% per annum
- Power cost is $0.16 per KWh
- Tier 1 FTE rolled up hourly cost is $175.00
- Tier 2 FTE rolled up hourly cost is $125.00
- Tier 3 FTE rolled up hourly cost is $110.00