WHITE PAPER

Reducing Total Cost of Ownership Through the Use of Blade Systems

Sponsored by: Hewlett-Packard

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May 2005

EXECUTIVE SUMMARY

Server blades, a relatively new form factor in the server market, offer businesses of all sizes the potential of reducing cost of ownership. The advantages of blades come not only from the consolidation benefits of housing several servers into a single chassis but also the consolidation of the associated resources – storage and the networking equipment - into a smaller form factor that can then be managed through a single interface.

Over the course of the last few years, server blades have become a firmly established technology that is helping to provide a solid foundation for a more productive, lower cost and highly leveraged IT infrastructure. Not only are blades moving into the mainstream market for large organizations, but increasingly they are becoming the server form factor of choice for mid-market companies as these organizations recognize the advantages associated with this platform of products.

To meet the business-critical operational requirements and provide their organizations with a competitive edge, IT personnel are specifically seeking to create simpler and easier-to-manage IT environments, with an infrastructure that increases application availability and performance, reduces acquisition and support costs, and adjusts quickly to changing business needs. IT infrastructures are being designed to provide much greater flexibility, and blade servers are a common first step in that process.

The most obvious way organizations are using blades to transform their businesses is through consolidation. Companies are consolidating their rack-optimized servers into a blade server environment for greater efficiency and simplicity. Through this consolidated platform, blade servers enable customers to react quickly to changing business needs by seamlessly scaling server, storage and network infrastructure. They also offer increased availability and manageability, making blade servers an attractive option for adopting scale out computing. Additionally, datacenter managers are increasingly adopting infrastructure virtualization to improve service levels, integrate and deploy applications faster, and respond quickly to changing business needs and market conditions.

IT MANAGEMENT CHALLENGES

To provide enhanced business value, IT managers are increasingly looking beyond point solutions to find better ways to manage IT resources. There is a current move underway to manage IT more comprehensively. This 'holistic' approach is no longer being used just by large businesses and enterprise customers, but is increasingly permeating the small and medium sized business (SMB) market. Managers in this segment realize the essential need that exists to address issues at the business service level. These challenges include:

☑ **Application availability**. Increasingly, business is done on a 24 x 7 basis, which in turn means that business services must be up and running almost constantly. Because of this requirement, applications and the underlying infrastructure that enable the business services need to be available constantly.

☑ **Application performance**. Increasingly customers are deploying applications to a broad constituency that includes employees, partners, and suppliers. The performance of these applications is critical to enabling business benefits from the IT infrastructure.

☑ **Infrastructure scalability**. The ability to scale the infrastructure easily to support more users and new applications is another area where companies are looking to enhance their capabilities as they begin to grow their IT infrastructures after the last few years of IT budget lock-downs. This scalability must be attainable with minimal additional costs, preferably via a solution which provides increased return on investment as more resources are deployed.

☑ **Better alignment of IT resources with businesses' priorities**. Businesses are increasingly looking to harness the power of scale in order to improve the cost of ownership. Therefore, organizations must squeeze more flexibility and capacity from their infrastructure. The ability to leverage IT resources that can be used in multiple ways is critical to unlocking the value of the IT investments.

☑ **Simplified infrastructure management**. To reduce costs, minimize mistakes and streamline the infrastructure management process, companies are increasingly seeking technologies that allow for the automation of day-to-day tasks.

☑ **Reduced total cost of ownership.** Demands to reduce the total cost of IT expenditures continue as a major focus area. Businesses are increasingly turning to solutions with a lower acquisition cost to drive down the capital investment necessary up front. Opportunities for cost reduction are most promising when IT managers can contain and lower the cost of managing infrastructure as IDC estimates that, on average, approximately 60-70% of server life-cycle costs are associated with infrastructure management.

In order to more effectively manage these challenges effectively, some SMB managers are looking to hardware vendors as partners for deploying comprehensive solutions across their IT environments. One method by which these issues are being addressed is through the additive deployment of blade server systems. The aim of

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this paper is to examine blades and identify key elements of the solution which may help SMB customers in addressing these challenges in the IT environment.

BLADE MARKET OVERVIEW

Market Definition

IDC defines a blade as *an inclusive computing system that includes processors and memory on a single board*. When blades are plugged into a chassis with a back plane that provides networking and power, the result is a *blade server platform*. Blade servers are more dense than rack-optimized servers because key components such as power, networking, and storage are not physically located on individual blades. Blades are usually operated like other server form factors in that individual blades are allocated to specific applications. Scaling either the storage or server capacity is typically achieved by simply adding more blades.

Primarily, blades simply represent a shift in server form factor, but because of the shared infrastructure associated with the chassis, power supplies, storage and networking equipment, server blades offer the opportunity to leverage the shift in form factor to deliver both capital and operational cost savings.

Market Development

Over the past couple of years, server blades have moved from a niche market opportunity to the beginning phases of mainstream market adoption. One contributing factor to this shift is the proven viability and impact blade technology delivers in combating the aforementioned challenges. As early adopters have become more experienced with the technology, they provided concrete evidence of both the technological and fiscal benefits of this new solution across large, medium and small scale deployments. More streamlined and cost-conscious SMB segment technology users are now seeing evidence that blades are not only a viable option but that the technology may deliver on the early promises of reduced costs, increased service availability and enhanced productivity. The attractiveness of this value proposition is significant.

The increasing acceptance of blades as a viable server platform is observable in the market share data over the last five years. While server blades have only been available for the last few years, in that time they have captured nearly 5% of the unit share worldwide – marking the fastest rate of adoption of any server form factor. This increasing share of the market has been driven by hyper growth in the blade space. In 2004 alone the market nearly doubled in size, and since 2002, the market has grown nearly 700%.

FIGURE 1

Blade Server Unit Shipments and Share, Q102 - Q404
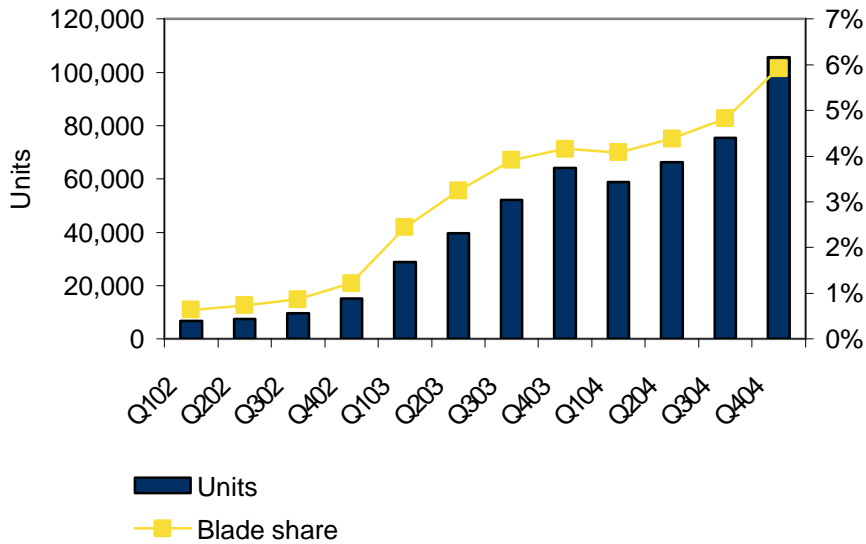
Source: IDC, 2005

This growth has been supported, in part, by an increasing product portfolio in the blade space. That portfolio initially encompassed only options in terms of the CPU capacity of the blade. This has quickly expanded so that customer today have choice at multiple levels including:

☑ CPU Capacity (1, 2, 4 way)

☑ Processor Types (Intel, AMD, Itanium, RISC)

☑ Operating Systems (Windows, Linux, Unix, Netware)

☑ Form Factor (multiple blades per chassis)

☑ Networking (Ethernet, Fiber Channel with multiple vendor products as well as pass through)

☑ Storage (Internal, External SAN or NAS)

All these choices are in turn expanding the total market size for blades. In particular IDC believes that these choices are broadening the profile of a typical blade customer so that today a significant percentage of blade users come from what would traditionally be termed as small and medium businesses.

In order to understand more quantitatively how blades are making their way into small and mid-size organizations we need to first look at the penetration of operating systems within the blade environment. In the overall server market, Windows based

servers consistently capture 60% of all server shipments. A large percentage of these shipments are associated with small and medium businesses.

By comparing the OS splits in the blade subset of the server market to that of the overall market (see Figure 2), it is clear that Windows-based blade adoption has been steadily increasing, quarter-over-quarter. Looking more closely, it becomes clear that around the same time blade servers began to experience a ramp up in wider market adoption this market segment hit an initial inflection point for the deployment of Windows OS on blade servers. This point is particularly significant when considering the high levels of penetration of Windows OS within the small sized business customer market. While Linux and the associate tools and services have matured immensely over the last few years – and will subsequently continue to represent a significant opportunity going forward in the blades market – ultimately IDC believes a substantial opportunity for blades lies with the Microsoft Windows OS.

Looking forward, the trend of greater blade usage by small and mid-market companies is clear. In Figure 3, illustrates IDC's latest expectations for blade servers shipments by company size. This data shows that not only does the mid-market currently contribute a significant percentage of blade server volumes today – roughly 37% - but that the percentage of sales to small and mid size businesses is expected to grow disproportionately faster than sales into large companies to the point where, by 2008, small and mid size organizations are expected to equate to over 55% of all blade server shipments.

FIGURE 2

Blade Server shipments by OS – Q102 – Q404
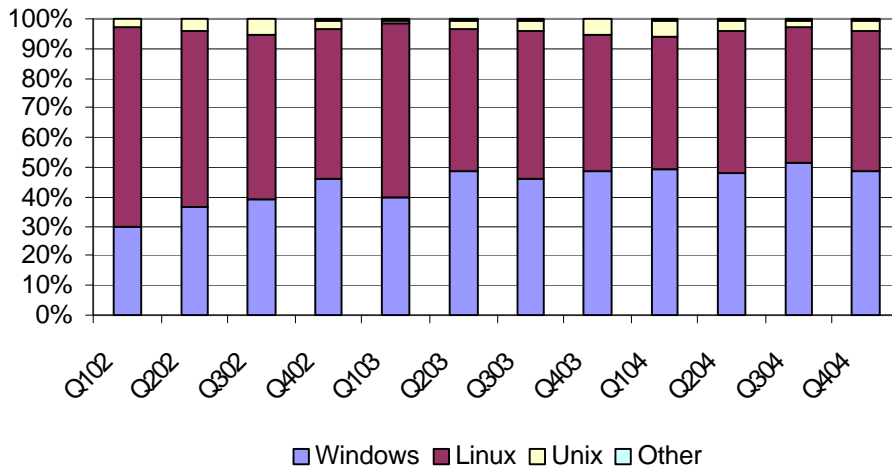
Source: IDC, 2005

FIGURE 3

Worldwide Server Blade Outlook Across Company Size, 2003-2008

Source: IDC, 2005

BLADES AND THE BUSINESS MANAGER

For IT managers, blades offer the potential for both immediate and longer-range financial benefits through a focus on bottom line cost reduction (both acquisition costs/capital expenditures and operational costs) and a focus on business process

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transformation. Specifically, blades are helping companies increase the availability of applications and the productivity of personnel using those applications as well as reduce the time required to roll out new products or services.

The Role of Blades in Infrastructure Cost Reduction

No matter what size the organization, the capital expenses associated with blade server deployments fall into three categories – acquisition cost and personnel necessary for the initial build out, system deployment, and system maintenance and future scaling. These are all factors in determining the total cost of ownership of a blade system. IDC believes that the greatest business benefits are derived from the operational improvements facilitated by blades. As one may expect, the initial system build out is generally the stage requiring the largest investment of time and money.

Initial Deployment

Because of the shared architecture of blades as compared with rack optimized servers, managers who are new to deploying blades are encouraged to invest enough time into fully planning out aspects such as storage, network switch options, KVM cabling, power access and cooling options prior to physically installing the first blade chassis. Blade vendors may offer planning and deployment services that are specifically designed to address the deployment issues involved with an initial blade server roll-out. In general, blades are not deployed with a 'rip and replace' strategy – where datacenter managers must tear out and subsequently replace all installed infrastructure, and vendor planning and development services can be helpful in accurately determining the best approach to individual blade deployments. Further extension of the system as needs arise in the organization will require additional capital expenditures, but when compared with build outs of rack-optimized or pedestal servers issues relating to power, cabling, etc., should have been accounted for in the initial system planning.

Economies of Scale

Blade servers were designed to leverage economies of scale with power consumption, storage, network connections and cabling so that a cost/benefit equilibrium is achieved at a faster rate than with rack-optimized or tower servers. The subsequent result is a declining cost per server when total capital expenses are amortized over the life of the entire system.

Beyond the hardware cost advantages of blades, potential additional cost savings are linked to the enhanced manageability of the blade products. In some cases, certain systems management tools or KVM equipment may be completely eliminated in a blade deployment. Additionally, blades offer significant reductions in the total cost of cabling in support of blade servers.

Customers with blade deployments also may find overall reductions in operating expenses as a result of the decrease in power consumption and floor space required in support of blade servers when compared with a equivalent number of rack-optimized servers. This reduction in power consumption comes as blades share a power source within the enclosure. That sharing of infrastructure means blades

consume power more efficiently and therefore end up needing less. In total, IDC has seen anecdotal evidence identifying total cost of ownership reductions of over 50% in blade server deployments versus rack-optimized deployments.

Blades for Small and Medium Businesses

Breakeven for blade systems today is attained once the chassis is roughly 50% populated with servers. After that point, from a cost of acquisition perspective, blades represent a more economical platform then stand alone devices. IDC has found that this "cross over" point is critical in deciding if a blade server installation is the best technology for an organization.

Today, a half full chassis represents approximately 6-8 servers – a relatively small number given the proliferation of distributed computing over the last few years. Distributed computing typically implies a one server-one application architecture whereby businesses scale their IT environment simply by increasing the number of servers in that environment. That paradigm allows customers to purchase technology only when they need it as well as to ensure capacity as resources are totally dedicated on a single device. This has meant that the number of servers inside an organization has grown tremendously, to the point where it is not atypical to find one server for every 10-15 employees. For a mid-market firm with 500 employees, this would equate to between 32 and 48 servers in the infrastructure. With HP's BladeSystem, these 32-48 servers would be hosted on 2-3 BladeSystem enclosures.

Ongoing Operations

This focus on scaling out server infrastructure has meant that while capital spending on new hardware is relatively efficient, the number of devices inside organizations has driven up operational costs significantly. Beyond the capital cost advantages, well-planned blade solutions are also designed to deliver operational cost reduction benefits in the form of better manageability – including server automation and virtualization. These capabilities provide firms with a platform for consolidation .

Often, customers cite that with blades they are able to maintain their distributed architecture and a one server / one application paradigm, but instead of having to manage these servers as standalone devices, with blades they are able to manage the entire chassis as a single entity – effectively creating a "distributed consolidation platform." Additionally, we find that blade system platforms also allows businesses to consolidate a layer of the networking infrastructure in the form the embedded chassis switches.

This drive to better manageability extends well beyond the simple monitoring of the server resources. Increasingly, IT administrators are taking advantage of the embedded management systems within the blade solution. These management systems are typically well integrated with both automation and virtualization add-ons. When the manageability aspects of blades is leveraged in the deployment of a server virtualization strategy – whereby one or more physical servers are 'virtualized' in order to present end users with the appearance of multiple computing environments – the strengths of both blade management and virtualization mutually reinforce each other and provide a compelling solution for creating dynamic IT environments. Things such as server provisioning software and virtual machine management allow the

administrator not only to manage the machine but also enable them to quickly and easily allocate software changes, manage patches and take advantage of virtual machines to further consolidation and drive efficiency within their IT environments.

HP delivers the management, automation and virtualization capabilities of its BladeSystems platform through the HP Systems Insight Manager (SIM) and ProLiant Essentials suite of software. This includes the Integrated Lights Out (iLO) management chip, which is embedded on every blade system board. HP also includes the ProLiant Essentials Advanced Pack for enhanced remote management, the ProLiant Essentials Rapid Deployment Pack (RDP) for deployment and the provisioning of software, patches, applications, and operating systems and the Virtual Machine Manager for managing and migrating virtual machines across the bladed environment.

Beyond the obvious blade and chassis management, HP has introduced new features that alleviate earlier customer concerns about the limitations on storage and manageability with blades. By embedding storage management software into SIM as well as offering more SAN switch options, HP is aiming to offer a simplified storage networking infrastructure within a blade environment

The Role of Blades in Business Transformation

Because of their modular, build-as-you-grow design, blades are a good choice for customers seeking servers in support of their IT-wide consolidation efforts. Since blades can be purchased and deployed almost on an ad hoc basis once the initial chassis installation is completed, they can provide users with the flexibility of starting small and growing tall as consolidation efforts progress from initial, silo'd undertakings to company-wide programs for change. Customers often cite the ease of use and serviceability of blade servers as drivers for adoption. Because the blade itself is a field replaceable unit, if a system goes down, the administrator is able to easily replace it and quickly restore service. Additionally, because blade servers are a "wire once and reuse" infrastructure, administrators no longer have to deal with complexity when adding new servers into their environment or when upgrading or replacing units within the datacenter.

Because blades offer such a compelling proposition with regard to several key practices such as IT, server and networking consolidation, server management, automation of administrative tasks – as well as the introduction of new applications and processes – such as deployment of virtual machine technologies and platform migration, IDC has found customers are increasingly turning to blade platforms as they undertake a business transformation process that is rooted in IT.

Increased Availability of Services

The enhanced manageability and consolidation of the infrastructure that are associated with blade systems means that small and mid size firms can also expect to benefit from blades through increased availability of services. For organizations of all sizes, the issue of downtime is key when selecting a server solution. This is an area for which blade servers were designed to offer greater flexibility and versatility than stand alone rack-optimized or tower servers.

Improved Serviceability

One of the advantages available with blades is the improved ease-of-access available with these servers. This benefit reflects the focus on improved serviceability that was factored in to the design of blade server architecture by OEMs. Because individual blades can be popped in and out of a system as needed, whether to provide additional compute capacity or to be taken out for servicing in the event of failure, the ease of service allows companies to quickly get the business applications back up and running.

Additionally some blade offerings allows the company to assign a specific server "personality" to a slot within the chassis, so that in event of a failure, once the new blade is inserted, the configuration of the old device is immediately re-established, the application is brought back on line and the business service is restored. This capability of business service availability is part of HP's software product portfolio. System Insight Manager and the ProLiant Essentials software tools for automation (RDP) provide blade users with state-of-the-art management tools designed to maximize efficiency in server deployment, provisioning and management. RDP helps significantly reduce the time required to install, configure and deploy servers, which enables higher levels of scalability at significantly faster rates.

Virtualization

Blades are also a valuable tool in the deployment of virtualization efforts, as separate virtual machines can be deployed across individual blades in a chassis and thereby provide a much-desired physical separation between the actual server computing devices that is unattainable with single-box rack-optimized servers. The management of these virtual machines is also enabled through the HP SIM value add packs, which enable unified management of multiple virtual machines through a single user interface.

Modular Design

HP has taken a modular design approach to its blade solutions, both in the hardware and in the software management stack. This not only gives the company greater flexibility in terms of developing new features or packages, but it also gives customers more control as they can now choose the exact packages for their organization based on a menu of options. This is especially useful for smaller companies that do not need all the capabilities or options that enterprise customers may require. The result is that customers can mix-and-match components to design a solution that best meets their particular needs.

Enablement of the Adaptive Enterprise

Finally, beyond the benefits blades provide in terms of IT rationalization through server and network consolidation, the standardization of the management software stack and the better manageability of shared virtual resources, blade servers are also serving as the foundation for emerging transformation initiatives such as dynamic resource provisioning and service automation that are delivered as part of HP's Adaptive Enterprise program. While these initiatives have a longer term focus, IDC believes that server blades are a critical step in the process to create flexible, highly

available, highly leveraged and productive pools of IT resources that are aligned with the needs and direction of the customers business.

CHALLENGES

Key barriers do exist, however, despite the wider range market adoption blades will experience in 2005. Top among these will be proving the general applicability of blades across IT organizational needs and mission-critical applications. As the market is just now reaching the beginning of the mainstream adopter phase of market uptake, IDC believes HP, along with other blade vendors in the x86 market, must overcome the challenge of the market perception of blades being the exclusive domain of specialty solutions for large infrastructures.

Messaging to the Mid-Market

As part of that effort HP will need to clearly articulate how small and mid-size organizations can map their needs to a complete blade portfolio. This includes creating a succinct value proposition that appeals to the market majority, continuing to drive down the cost of computing and networking, as well as highlighting the importance of IT infrastructure reliability availability and scalability to all customers. Key to all these challenges is the development of a future roadmap that is both pragmatically tangible in the near term and strategically comprehensive in the longer term.

Perceptions Concerning the Lack of Standards

Another barrier that must be overcome is that of the perceived lack of standards in these servers. IDC research shows that standards are important to mainstream technology users because standardization ensures price competition as well as reduces choice in a multi-vendor environments. On the pricing side, the dynamics of the blade marketplace are already addressing the drive for commoditization. In terms of choice, HP crafted its BladeSystem chassis to support multiple generations of blades so that chassis investments could be leveraged over a 5-7 year time frame.

Additionally, HP also clearly sees the value in the endorsement of standards across its blade products. This can be evidenced by its commitment to deliver its customers as much choice for the networking layer of the BladeSystems solutions. In January 2005 HP announced that it was working with Brocade to offer the Brocade SAN switch module with HP BladeSystems. This announcement followed just two months after HP's announcement regarding its intentions to develop a gigabit Ethernet switch module for the HP BladeSystem

A Long Term Commitment

Finally, some potential blade customers currently question the commitment of different vendors to the long term future development of blade technology. This is a challenge where HP possesses significant home court advantage. Throughout its history of innovation and execution, HP has proven time and again its ability to invent and bring to market next-generation technologies. HP as an organization has committed itself to the blade form factor across not just the server element of its BladeSystem portfolio, but also its switches, storage and PC products.

OPPORTUNITIES

There exist several opportunities for HP to move to the forefront of the blade server market as this next generation of server technology begins to come into its own.

Cultivating the Ecosystem

HP's focus on standards as it builds out its blade portfolio presents the company with an opportunity to overcome the present market perception of blades as proprietary. As blade customers repeatedly articulated, due to support issues, they have no intention of ever mixing vendors within a chassis and that openness in the blades needs to come in the networking and software layers. HP has a proven track record of successfully working with partners across all aspects of the hardware, software and services layers, a fact which HP can leverage to provide evidence to customers of its ability to continue this strategy going forward.

HP is a company which recognizes that the long term benefits will be greater in a larger, more open market for blades that takes off in the short term versus a more closed market for proprietary blade technology which requires years to cultivate in the tenuous anticipation of market exclusivity. HP's progress in opening up the platform includes all the work the company has already done in creating specific services around the BladeSystem platform as well as the partner ecosystem the company continues to develop to further enhance customer choice.

A Customer Focus

As HP has substantial experience in supporting companies of all sizes in their build out of server, storage, networking, software infrastructure in support of mission-critical business functions, it is reasonable to predict that HP' will continue products and services to SMB customers as they roll out of their blade solutions. It is also clear those solutions will very much take a systems approach and include innovation on the server platform that include a wealth of choices that span both the blade form factor as well as the types of processors running those blades. That systems approach to solutions also crosses into the storage and networking layers as integration in the chassis not only offers economy of scale but also better integration in order to support business transformations. HP has designed their solutions to better ensure that these transformations involve the least possible disruption to existing environments.

In that way, blade technology is not necessarily disruptive, but it must be deployed and supported by a vendor that possesses a deep understanding of existing technologies and procedures in order to promote a smooth transition. The vendor must also have a clear understanding of exactly how blade technologies differ from traditional server environments, both in terms of short-term deployment and long-term support. Thus far, all signs point to HP being able to do precisely this.

CONCLUSION

Server blades bring significant advantages over rack-optimized and pedestal servers. Their ability to leverage shared components, such as networking and power connections, combined with their flexibility in support of virtualized server resources, makes them a natural fit with today's push for consolidation across IT organizations.

The unified management interface of blades helps enable IT personnel to effectively and easily configure, deploy and manage multiple server resources from a single interface.

From a financial perspective, blades offer cost benefits over rack-optimized servers both in terms of the initial acquisition costs (when chassis are deployed at or over half full) and the continued financial savings as a result of the significantly improved management capabilities.   From an ease of use perspective, blades offer opportunities for modular computing that can be rolled out at the user's pace, not the vendor's, and enable IT managers to scale out their computing needs on an as-needed basis over time.

CASE STUDY

The **Screen Actors Guild - Producers Pension and Health Plans** is the benefits arm of the Screen Actors Guild (SAG), a union of US-based actors across the Hollywood and independent film industry. With headquarters in Los Angeles, CA, SAG represents approximately 120,000 actors. The SAG Producers' Pension & Health Plans (SAG-PPHP) organization supports over 40,000 actors and their families for their pension and health benefit needs. The SAG-PPHP website provides a portal for members to access their personal information, make plan selections, pay premiums and gain more information about their options. For this organization, being able to offer reliable data access to a client base from all over the US as well as support an in-house team for a comprehensive set of IT needs required an infrastructure that is both reliable and easy to manage.

In 2003, the in-house IT team at SAG-PPHP undertook an upgrade to its complete IT systems with the goal to reduce costs and improve efficiency of the computing systems. The organization remodeled its data center and was working to consolidate across their servers. As SAG-PPHP had historically been an HP/Compaq shop, the team went to HP when the time came to buy new servers. Initially, the team looked to blades in order to reduce overall costs by creating a more homogeneous infrastructure, recalls Kevin Donnellan, Director of Enterprise Infrastructure at SAG-PPHP

The team also looked to blades for the advantages available in server management options. They were looking for a technology "that allowed us to create images of servers that we could very easily replicate. In addition to that, we looked at the energy efficiency, the footprint, the real estate, [which was] at a premium." said Donnellan. Blade servers from HP turned out to be the right tool for SAG-PPHP to address those needs. SAG-PPHP started out initially deploying six dual processor blades and has since scaled to more than 40 blades in 6 chassis, across two physical sites. These represent approximately 40% of all SAG-PPHP's servers across both primary and disaster recovery sites. This was all implemented with an overall 20% reduction in operating costs.

The servers support the web serving, file & print and email serving environments for SAG-PPHP. Donnellan's team has made use of the rapid deployment pack (RDP) and integrated lights out (iLO), which are part of the HP BladeSystem product set.

With the RDP, the organization is able to install, configure and deploy blades via a web-based console. With iLO, SAG-PPHP is able to manage its server remotely. As a result, the team is able to support the servers with relatively small investment of administrator time. Donnellan and his colleagues are now in the process of mastering HP System Insight Manager to further improve their management efficiencies with blades. Donnellan stated that benefits such as increased energy efficiency, reduced power consumption, higher system up time, ease of management, and lower overall cost has been part of the experience at SAG-PPHP so far.

A key driver in his decision to work with HP was the organization's experience with HP's proven track record of quality products and excellent customer service. "One of our primary factors [in choosing a blade vendor] was the finger pointing," said Donnellan. "In the process [of talking to sales associates], we just became more and more comfortable with a one stop shop…It has proved a lot easier to deal with."

To date, Donnellan and his team are happy with their decision and have clear plans to migrate their infrastructure to blade-centric servers as refresh opportunities arise. "In the future, we are looking at again removing any of the legacy standalone and rack mount servers that we have left and moving all…applications to the blade arena."

"We have become an HP shop – almost 100% now – from desktop on up to the server layer, and this has allowed us to provide better service to our participants at a lower cost." said Donnellan.

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