Blade Servers Have Arrived
The emergence of Blade Servers continues to generate a lot of buzz within the computer industry. Major OEMs have clearly positioned the blade server as their primary platform to deliver simplified management, reduced floor space, minimized cabling and significantly lower power consumption along with robust, enterprise-class functionality. As businesses, regardless of their size, are challenged to manage an explosive information growth with constrained budgets and resources, the blade server is rapidly becoming the platform of choice.

Industry adaptation of blade servers is growing at an exponential rate with industry analysts projecting blade servers to represent the fastest growing segment of the overall global server market. International Data Corporation (IDC) has projected worldwide global revenues of blade servers to increase from US $3B in 2005 up to US $11B in 2010, representing 18.1% of total server sales by 2011 compared to 6.6% by the end of this year.

Blade Servers - Why Such A Stir?
Companies are seeing a tremendous growth in the information they handle and are looking for better options to deploy and manage data. Scaling data centers using traditional servers is creating several challenges that stress the capabilities of these data centers. For example, high power consumption and associated cooling requirements quickly become cost prohibitive. Traditional servers also need more floor space and require complex cabling which in turn weakens system reliability. Furthermore, traditional server complexes are more difficult to manage and require expensive, skilled support resources that start to tax the IT budget.

In addition to data centers, two other market segments are rapidly embracing blade servers - Small and Medium Businesses (SMBs) and large companies with multiple locations. These users have even more limitations on floor space, power and cooling. OEMs are aggressively highlighting the space, power and cost efficiencies of blade servers to this set of customers. The concept of “data center in a box” is especially appealing to these customers who typically do not have the IT infrastructure or in-house expertise to manage their data like large data centers of the Fortune 500 users.

There is a common misconception that small installations do not need high performance, availability and reliability. The reality is, SMBs as well as retail stores and branch offices of large chains handle growing amounts of data and cannot afford any downtime. These applications must therefore be able to support large amounts of storage that can be accessed quickly and have built-in protection against loss of data. OEMs are responding to these requirements by adding intelligent storage options such as RAID capabilities to their blade servers.

Customers are resonating with the concept of blade servers. Integration of servers, storage, networking, I/O devices and other components into a single, modular chassis brings tangible and quantifiable benefits to customers. For example, consolidation of functionality into a single blade server chassis provides a dramatic reduction in floor space (35% to 45%) and a sharp reduction in power consumption (up to 25%) and cooling requirements, allowing companies to be more environmentally responsible. Blade servers also help eliminate complex cabling and interconnect (up to 85% less wiring), further improving data center reliability.

In addition to the density, power and cooling benefits, blade servers provide simplified management while retaining enterprise-class performance, reliability and availability. Expansion is much easier for blade server installations; the user can simply slide another blade to add the desired functionality.

Blade Server Storage Options
Blade servers were initially deployed within the corporate data centers as a way to provide enterprise-class server capabilities with simplified management in a compact footprint. Typically, storage was deployed externally to the blade servers either via a Storage Area Network (SAN) or as Direct Attached Storage (DAS) as shown in Figure 1.

The next generation blade servers from major OEMs accommodate storage within the blade server chassis. As shown in Figure 2, a typical new generation blade server implementation consists of multiple disk drives that can be plugged directly into the server chassis to form a storage pool. This storage pool may be shared by one or more server blades via some type of integrated network within the blade server chassis. Using denser packaging and smaller form factor disk drives, OEMs will be able to offer a whole new class of “storage blades” complete with disk drives and RAID controllers. With servers, I/O devices, network fabric, intelligent storage and other components including power supplies, all in the same chassis, the blade server could truly become a “data center in a box”.

![Blade Server Chassis](image1)

![Disk Array](image2)
**Design Considerations for Blade Server Storage**

A blade server chassis with integrated storage brings all the benefits of blade servers to storage. Storage can now share power supplies with the server blades and other components within the chassis, reducing overall power consumption. Integrated storage also reduces floor space requirements, cabling complexity and increases overall ease of managing a single box.

**Blade Server Storage Requirements**

While the primary purpose of storage subsystems is to provide the raw capacity to store information, users also expect high availability and reliability. Long interruptions, or worse yet, loss of data, can be very expensive or even fatal to a business. Blade server storage must be able to tolerate component and power failures. It must also provide redundancy and the ability to recover from failures.

In order for blade servers to be successful in branch office and SMB installations, it must be able to support a variety of applications ranging from transaction intensive business applications to bandwidth intensive surveillance systems. Blade server storage servicing these diverse workloads must be capable of delivering high performance with the minimum amount of specialized tuning.

In addition, blade server storage must be easy to deploy, use and manage. As the needs of the business grow, the storage must scale easily. This is particularly important for SMB and branch office installations that do not have the manpower or technical expertise typically found within a corporate data center.

The management software controlling the blade server must be designed for simplified manageability and must work with all the components in the chassis. The software supporting the storage controller must be capable of easily interfacing with the OEM’s management software and various other modules within the blade server chassis.

The most formidable challenges in integrating storage within the server chassis are footprint and power constraints. Integrated storage puts additional strain on power supplies and cooling fans built into the chassis. It is therefore critical that the storage controllers consume minimum power and are intelligent enough to turn off disk drives and other system components as necessary to conserve power. Since the airflow inside a blade server chassis is limited, the storage controller must be designed to operate reliably with limited airflow. In order to meet space limitations, the storage controller must be built with highly integrated components.

Balancing these diverse and often conflicting requirements for blade server storage without compromising performance and reliability is not an easy task. Technologies used to build traditional high performance storage controllers consume more power and do not fit into small footprints, making them unsuitable for space and power challenged blade server environments. Technologies used for entry-level storage do not deliver the performance, high availability or scalability required by blade server users.

**Adaptec Blade Server Storage Solutions**

Adaptec delivers unique storage solutions that are ideal for blade server applications. These solutions consist of industry-leading devices based on Adaptec’s breakthrough RAID Storage Processor (RSP) architecture, complemented by enterprise class Adaptec RAID software. Adaptec solutions were developed in response to the evolution of the blade server market and enable storage to finally become a fully integrated feature of the overall blade proposition.

Adaptec solutions, both the devices and the software, are designed to deliver full redundancy and data protection, ensuring no single point of failure within the system. The devices use specialized hardware engines and data path automation that can match or exceed the I/O performance of enterprise class systems while consuming much lower power. Figure 3 shows the block diagram of the Adaptec AL3450 UltraSlice-MPx™, Adaptec’s third generation device based on the RSP architecture. The AL3450 can perform RAID operations such as drive rebuild, RAID initialization and RAID migrations faster than any general purpose CPU driven software solutions on the market today.

Adaptec’s solutions also meet the space and power constraints of the blade server storage. A typical RAID controller card using the AL3450 consumes less than 20 Watts of power and can be implemented using less than 10 square inches of card space. Figure 4 shows one such implementation.

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**Figure 2**

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Software is an extremely critical component of a RAID storage solution. Adaptec offers the field proven, enterprise class RAID software that further enhances the robustness and performance of blade server storage. This software is designed to communicate directly with the customer’s software that manages various blade server modules and seamlessly integrates into the overall blade server chassis ecosystem. The Adaptec RAID software can self-configure the storage in addition to providing direct indications of failed components to the management software. This allows OEMs to retain their existing management software infrastructure for simplified management of the blade server system.

All together, Adaptec RAID ASIC solutions provide the perfect platform for RAID-enabled shared storage that can be fully integrated into the blade chassis. As the industry moves to high density servers and storage, Adaptec is keeping pace by delivering the essential building blocks OEMs need to deliver highly reliable, compact, energy-efficient blade server storage with best-in-class performance.