A

Seminar report

On

BLADE SERVER

Submitted in partial fulfillment of the requirement for the award of degree
Of MCA

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Acknowledgement

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Preface

I have made this report file on the topic **BLADE SERVER**,; I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

CONTENT

INTRODUCTION TO BLADE SERVER

DEFINITION OF BLADE SERVER

Blade servers are part of a computer configuration where power, cooling, storage and connectivity are largely provided by an outer housing or chassis. The chassis contains and services a number of specialised, stripped down motherboard units - the blade servers - each one a complete computer or service device containing only vital processing and storage elements. Blade server technology was initially developed in the early millennium through a partnership between IBM and Intel. Later, a number of major companies, led by IBM, formed an industry community´ in February 2006, with a website base at blade.org. The mission of the community is to accelerate the growth and adoption of blade technologies in the market. As part of the community development, similar to their action with PC specifications in the 1980s, IBM made the specifications for blade servers open allowing any manufacturer to develop and build blade server compatible products and solutions A number of computer manufacturers has consequently joined IBM and Intel in blade server manufacture. Some of the major players in the field include HP, Sun Microsystems, Dell and Hitachi. Computing blade servers are unique computers, often dedicated to a single application, and the facilities they lack are provided either within the chassis, or, particularly with storage, over a network. However, not all blades are computing blades, but may instead provide connectivity, storage, system management or other services for the system or chassis blades benefit, or even the wider network.

CONCEPT OF BLADE SERVER

Blade servers are self-contained computer servers, designed for high density. Whereas a standard rack-mount server can exist with (at least) a power cord and network cable, blade servers have many components removed for space, power and other considerations while still having all the functional components to be considered a computer. A blade enclosure provides services such as power, cooling, networking, various interconnects and management – though different blade providers have differing principles around what should and should not be included in the blade itself (and sometimes in the enclosure altogether). Together these form the blade system. In a standard server-rack configuration, 1U (one rack unit, 19" wide and 1.75" tall) is the minimum possible size of any equipment. The principal benefit of, and the reason behind the push towards, blade computing is that components are no longer restricted to these minimum size requirements. The most common computer rack form-factor being 42U high, this limits the number of discrete computer devices directly mounted in a rack to 42 components. Blades do not have this limitation; densities of 100 computers per rack and more are achievable with the current generation of blade systems. Blade servers were developed in response to a critical and growing need in the data center the requirement to increase server performance and availability without dramatically increasing the size, cost and management complexity of an ever growing data center. To keep up with user demand and because of the space and power demands of traditional tower and rack mount servers, data centers are being forced to expand their physical plant at an alarming rate.

BLADE SERVER : LESS SPACE, MORE WORK

When companies like RLX Technologies and Egenera took the first step in making blades, no one knew that it would turn into a war between the giants of information technology. But soon biggies like HP, IBM, Sun and Dell started unveiling their blade wares one after another and now RLX and Egenera are relegated to the background while HP and IBM have come to the forefront.

But, before blades rule the server world, there are many problems that need to be addressed urgently and crises that need to be resolved to show the real application and worth of blades. After the dot-com bust, the actual projections for blade shipments have come down by almost half and all the blade vendors promoting the business are treading cautious. In 2001, IDC expected blade server sales to hit $4.5 billion by the year 2005 but IDC now says that the total market will be somewhere close to $2.5 billion.

Two key pointers:

The problems are realistic. Suppose users dumped their old servers and bought blades, it would still hurt blade vendors because they also hawk and support older servers.

Besides, blade vendors have yet not collectively come out with approved industry standards. Many of the components are built on industry standards but there are many points on which the design of blades can differ. For example, the blade chassis in which the blades slide into are still based on proprietary standards. The dimensions of different blade and rack mounted servers can also vary widely. Thus, there is a need for almost total standardisation to increase the volumes in the market.

Big players like HP and IBM do not seem highly motivated when it comes to making their blade servers interchangeable in true sense because they perceive a threat from smaller vendors, who upon getting the opportunity will proliferate much faster because of low pricing.

What's in store?

However, in the days to come Blade servers will have a more powerful role to play. "Blades, as part of a complete, end-to-end technology architecture, can reduce total cost of ownership

by dramatically improving resource utilisation and reduce management cost in existing data centre environments. This will play a key role in an organisation's IT deployment strategy going forward," says K P Unnikrishnan, country head, Marketing, Sun Microsystems.

Blade servers are extremely dense, modular server solutions and are redefining how customers think about their technology infrastructures. According to IBM's own estimates gathered from industry analysts, the company estimates that worldwide the market for blade servers will grow from $133 million today to more than $3.7 billion by 2006 and that about 26 percent of companies plan to purchase a blade server in the next 18 months. "It is clear where we are heading. Blade servers are poised to become a basic infrastructure component and a major computing platform. Blades will help us usher our customers into the next step of e-business, which is the world of e-business on demand," says Satyanathan.

One of the key values of an on demand world is creating a flexible infrastructure and one that can react to any changes, all in real time. Customers expect computing power in a much more flexible way. Various customers have distinct requirements, and the vendors can not force them all into the same mould. Therefore, most of the vendors' strategy should be to leverage their knowledge and expertise in servers, software and storage, as well as work with industry-leading alliance partners, to provide customers complete blade solutions that can be managed easily and help reduce total cost of ownership.

Key drivers

- The space constraint in top cities like Mumbai, Delhi, Bangalore and Chennai.
- The need for cost-effective computing power.
- The need for a highly manageable solution, making it easier and user friendly for a CIO.
- Easy to manage and maintain and lower power consumption.

The flip side

- The overall blade server acquisition cost is higher than that of a complete set of rack mounted servers, because of the additional cost of a blade server chassis.
- Although blades save money on the management side, initial costs are not any better than those of traditional servers.
- In a blade server, the I/O paths are shared, leading to limitations in the number of peripheral I/O's that can take place, such as disk I/O or server-to-server network communication.
- Blade servers cannot be retired and replaced in the same way regular rack mount servers can, and there is a loss of flexibility in the way servers can be interconnected.
- Blades still have to prove that they can scale up to meet the requirements of high-end database applications.

SERVER BLADE

In the purest definition of computing (a Turing machine, simplified here), a computer requires only;

1. Memory to read input commands and data

2. A processor to perform commands manipulating that data, and

3. Memory to store the results.

Today (contrast with the first general-purpose computer) these are implemented as electrical components requiring (DC) power, which produces heat. Other components such as hard drives, power supplies, storage and network connections, basic IO (such as Keyboard, Video and Mouse and serial) etc. only support the basic computing function, yet add bulk, heat and complexity, notto mention moving parts that are more prone to failure than solid-state components. In practice, these components are all required if the computer is to perform real-world work. In the blade paradigm, most of these functions are removed from the blade computer, being either provided by the blade enclosure (e.g. DC power supply), virtualised (e.g. iSCSI storage, remote console over IP) or discarded entirely (e.g. serial ports). The blade itself becomes vastly simpler, hence smaller and (in theory) cheaper to manufacture.

SERVER BLADE

BLADE SERVER TECHNOLOGY

Blade servers were developed in response to a critical and growing need in the data center: the requirement to increase server performance and availability without dramatically increasing the size, cost and management complexity of an ever growing data center. To keep up with user demand and because of the space and power demands of traditional tower and rack mount servers, data centers are being forced to expand their physical plant at an alarming rate. Enter blade servers. They consolidate power and system level functions into a single, integrated chassis and enable the addition of servers and other components such as communications and peripheral connections via easy to install blades. Blade server technology greatly increases server density, lowers power and cooling costs, eases server expansion and simplifies data center management. Blade servers are not just a new way to package traditional computing components. Rather, they are integrated systems designed to deliver server performance inefficient, high density, easy to expand, and easy to manage units.

HARDWARE

1-Servers Blades- High density computing engines with 1 to 4 processors and memory

2-Blade Chassis-enclosures with integrated power and racks for housing server blades, communication blades and connections to external peripherals and inter-chassis links

3-Communication Blades- integrated blades with Ethernet, Infini Band and proprietary communication adapters and switches

4-Power and Cooling Systems- centralized power distribution components that power the blade chassis and components

5-Storage Subsystems- hard disk and tape storage subsystems can be inside the blade chassis or external to the chassis. Blade servers can be disk-less since they can boot from external storage in a Storage Area Network or SAN. This configuration can increase reliability and reduce space requirements by partitioning storage resources in one centralized location and computing resources in another. This also eliminates storage redundancies and simplifies storage management.

SOFTWARE

1-Software Management Tools- management software that enables server administrator stodeploy, control and monitor server resources.

2-Virtualization Software- software that enables maximum usages of server resources by creating virtual server resources that tap physical resources as needed by the application usage.

IBM HS20 blade server. Two bays for 2.5" (6.4 cm) SCSI hard drives appear in the upper left area of the image

BLADE ENCLOSURE

The enclosure (or chassis) performs many of the non-core computing services found in most computers. Non-blade computers require components that are bulky, hot and space-inefficient, and duplicated across many computers that may or may not be performing at capacity. By locating these services in one place and sharing them between the blade computers, the over all utilization is more efficient. The specifics of which services are provided and how vary by vendor.

1-POWER

Computers operate over a range of DC voltages, yet power is delivered from utilities as AC, andat higher voltages than required within the computer. Converting this current requires power supply units (or PSUs). To ensure that the failure of one power source does not affect the operation of the computer, even entry-level servers have redundant power supplies, again adding to the bulk and heat output of the design. The blade enclosure's power supply provides a single power source for all blades within theen closure. This single power source may be in the form of a power supply in the enclosure or adedicated separate PSU supplying DC to multiple enclosures. This setup not only reduces the number of PSUs required to provide a resilient power supply, but it also improves efficiency because it reduces the number of idle PSUs. In the event of a PSU failure the blade chassis throttles down individual blade server performance until it matches the available power. This is carried out in steps of 12.5% per CPU until power balance is achieved.

2- COOLING

During operation, electrical and mechanical components produce heat, which must be displaced to ensure the proper functioning of the components. In blade enclosures, as in most computing systems, heat is removed with fans. A frequently underestimated problem when designing high-performance computer systems is the conflict between the amount of heat a system generates and the ability of its fans to remove the

Heat. The blades shared power and cooling means that it does not generate as much heat as traditional servers. Newer blade enclosure designs feature high speed, adjustable fans and controllogic that tune the cooling to the systems requirements. At the same time, the increased density of blade server configurations can still result in higher overall demands for cooling when a rack is populated at over 50%. This is especially true with early generation blades. In absolute terms, a fully populated rack of blade servers is likely to require more cooling capacity than a fully populated rack of standard 1U servers.

3- NETWORKING

Computers are increasingly being produced with high-speed, integrated network interfaces, and most are expandable to allow for the addition of connections that are faster, more resilient and run over different media (copper and fiber). These may require extra engineering effort in the design and manufacture of the blade, consume space in both the installation and capacity for installation (empty expansion slots) and hence more complexity. High-speed network topologies require expensive, high-speed integrated circuits and media, while most computers do not utilise all the bandwidth available. The blade enclosure provides one or more network buses to which the blade will connect, and either presents these ports individually in a single location (versus one in each computer chassis),or aggregates them into fewer ports, reducing the cost of connecting the individual devices. These may be presented in the chassis itself, or in networking blades.

4 –STORAGE

While computers typically need hard-disks to store the operating system, application and data for the computer, these are not necessarily required locally. Many storage connection methods (e.g. FireWire, SATA, SCSI, DAS, Fibre Channel and iSCSI) are readily moved outside the server, though not all are used in enterprise-level installations. Implementing these connection interfaces within the computer presents similar challenges to the networking interfaces (indeed iSCSI runs over the network interface), and similarly these can be removed from the blade and presented individually or aggregated either on the chassis or through other blades.

The ability to boot the blade from a storage area network (SAN) allows for an entirely disk-free blade. This may have higher processor density or better reliability than systems having individual disks on each blade

HP Blade System c7000 enclosure (populated with 16 blades), with two 3U UPS units below

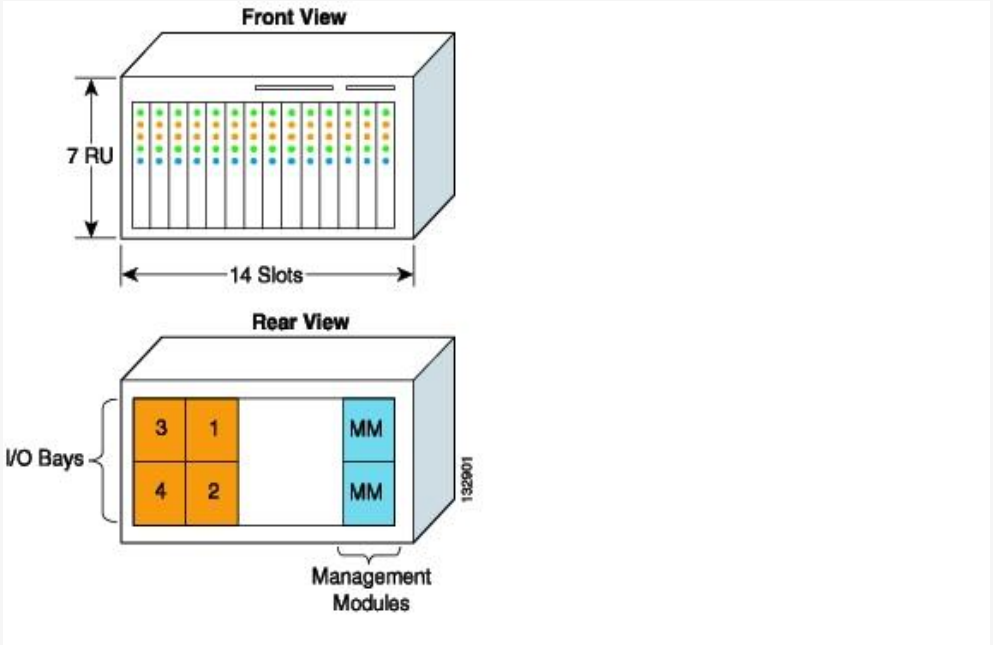
5- CONNECTIVITY

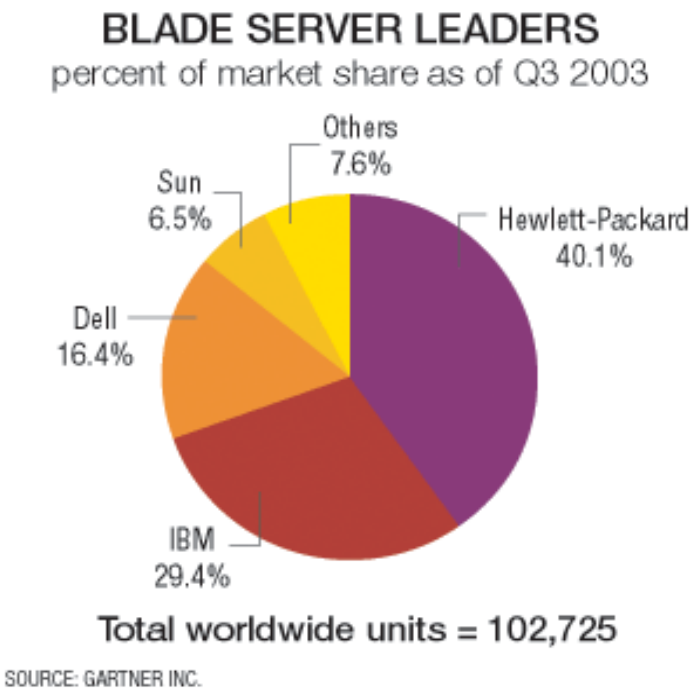
Blade servers always have some limited connectivity, if only Ethernet ports to connect to the chassis. The main external connectivity is by design provided via the chassis. At the heart of the chassis connectivity will be an Ethernet and/or Fibre Channel switch, connecting each of the blade servers to the LAN (Local Area Network). There may be more tha none switch unit in a chassis, which can either be used to provide a redundant connection to a single network, or connection to more than one network. Other connectivity is also provided by the chassis, but this is typically limited to USB and VGA for monitor connection, with possibly PS2 connections for I/O with mouse and keyboard. It salso likely that a chassis will contain an optical drive, although at need all of these functions and more can be added to the chassis through the use of specific blades in the system.

BLADE SERVERS ARCHITECTURE

Each blade server is a complete computer, albeit stripped of some functionality. A typical computing blade will contain one or two CPUs with supporting chipset on a specialised motherboard, RAM, and little else Despite the advantages of storage outside the blade chassis, many blades have the capacity to take one or two hard drives, usually SATA. Other functionality may be present, such as on board graphics and VGA output, and USB connectivity, but the more technology that is held on the blade the less advantage is being taken of the benefits blade server architecture offers. Although most blades provide computing services, there are other common functions that a blade can usefully provide. For instance, some blades are specifically designed to provide storage, offering a large number of hard drives. Others provide connectivity options and system management facilities. The configuration of blades and their functions can be balanced at the time of purchase and modified in ongoing use to meet particular business demands.

Blade servers typically have a front panel containing a number of informational LEDs, relating to power and system activity. There may additionally be indicators of system failure, which maybe general or specific to blade components. These optional features will invariably come at a cost premium.





Total worldwide units of blade servers leaders are 102,725 units out of which percentage of market share as per 2003 is given below:

SUN – 6.5%

DELL – 16.4%

IBM – 29.4%

HEWLETT PACKARD – 40.1% and

OTHERS – 7.6%

USES OF BLADE SERVER

1-Blade servers are ideal for specific purposes such as web hosting and cluster computing. Individual blades are typically hot-swappable. As more processing power, memory and I/O bandwidth are added to blade servers, they are being used for larger and more diverse workloads.

2-Although blade server technology in theory allows for open, cross-vendor solutions, at this stage of development of the technology, users find there are fewer problems when using blades, racks and blade management tools from the same vendor.

3-Eventual standardization of the technology might result in more choices for consumers; increasing numbers of third-party software vendors are now entering this growing field.

4-Blade servers are not, however, the answer to every computing problem. They may best be viewed as a form of productized server farm that borrows from mainframe packaging, cooling, and power supply technology. For large problems, server farms of blade servers are still necessary, and because of blade servers' high power density, can suffer even more acutely from the HVAC problems that affect large conventional server farms.

ADVANTAGES OF BLADE SERVER

1-**Reduced Space Requirements** - Greater density provides up to 35 to 45 percent improvement compared to tower or rack mounted servers.

2-Reduced Power Consumption and Improved Power Management - consolidating power supplies into the blade chassis reduces the number of separate power supplies needed and reduces the power requirements per server.

3-**Lower Management Cost** - server consolidation and resource centralization simplifies server deployment, management and administration and improves management and control.

4-**Simplified Cabling** - rack mount servers, while helping consolidate servers into a centralized location, create wiring proliferation. Blade servers simplify cabling requirements and reduce wiring by up to 70 percent. Power cabling, operator wiring (keyboard, mouse, etc.) and communications cabling (Ethernet, SAN connections, cluster connection) are greatly reduced.

5-Future Proofing Through Modularity - as new processor, communications, storage and interconnect technology becomes available, it can be implemented in blades that install in to existing equipment, upgrading server operation at a minimum cost and with no disruption of basic server functionality.

6-Easier Physical Deployment - once a blade server chassis has been installed, adding additional servers is merely a matter of sliding in additional blades into the chassis. Software management tools simplify the management and reporting functions for blade servers. Redundant power modules and consolidated communication bays simplify integration into data centers and increase reliability.

DISADVANTAGES OF BLADE SERVER

Blade servers are high-powered processing servers that are often used in network settings where more than four or five computers work off of a grid, all connected to the same server. There are quite a few advantages for business settings when this setup is used and many benefits that make the purchase and set up worthwhile for the most part. However, as with any technological setup that involves processing equipment, there are also disadvantages.

1-Configuration Expenses

The initial setup of a blade server network is typically a pretty complicated process, generally because each different manufacturer has their own brand-specific configuration settings and parameters that either require the paid training of a business' in-house IT department or the paid installation by one of the representatives of the manufacturer. Either way, the initial setup and configuration costs alone are enough to entice a prospective user to pursue another option.

2-Unit Utilization

In order for a blade server to be properly utilized, each of the available blade slots in the server rack should contain a blade. If a blade server system is installed that is capable of holding over a dozen blades in its chassis and is only utilizing three or four blade slots, a less expensive option could have more than likely been purchased. The blade chassis alone can run anywhere from $4,000 to $6,000.

3-Technology Advancements

The purchase of a blade server unit is an investment that locks a user into the unit that has been purchased, without availability for either new vendor integration or hardware updating. With the rate of speed that server technology--and technological hardware in general--is advancing, the unit purchased may very well become obsolete within a period of five years. Moreover, if a manufacturer other than the one that built the unit purchased introduces a new hardware add-on that may be beneficial, chances are the unit won't be compatible with the hardware because no blade server equipment is standardized.

4-Temperature Requirements Blade sever units that are utilized to their full potential can be an investment of over $50,000 to enter into. When a blade server chassis is filled to

capacity and is being utilized to its full potential, the unit itself will generate a substantial amount of heat.

CONCLUSION

Blade servers are efficient solutions for data centers requiring flexible, high-density deployment and management of high performance servers. Blade servers can pack more server performance into less space while reducing cost and complexity, simplifying deployment and management, and improving overall data center performance.

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