Research Advisory

Blade Computing: Thinking Beyond the Specs

Introduction

For many blade computer buyers, the decision to purchase blade technology is often made on the basis of processing power, heating/cooling characteristics, and hardware/software costs. For this class of information technology (IT) buyer, all blades are essentially the same, so buying on the basis of performance, power consumption/heat dissipation, and cost seems only logical.

But *Clabby Analytics* would argue that there are several other equally-important (if not more important) elements that need to go into the buying criteria equation when it comes to buying blade computers. Some of these include:

1. What does the blade vendor's blade management product set look like? (Does it include tools for monitoring and metering blade use; can it automatically shut down blade components if they become overheated; does the vendor provide virtualization and provisioning software?);
2. What does the blade vendor's ecosystem look like? (Has the vendor opened-up its blade specifications such that dozens or hundreds of prospective business partners can build to their particular blade environment? Has the vendor succeeded in capitalizing on its ecosystem by bringing more blade functionality more quickly than its competitors?); and,
3. What does the blade vendor's strategic roadmap look like? (There are several different types of blades coming to market including hybrid blades that run two different processor types; storage blades that can cache loads of storage close to blade processors for very rapid processing; and network blades that can perform gateway and bridging functions. Does your prospective vendor have plans in place to incorporate these designs?).

In this *Research Advisory*, *Clabby Analytics* suggests that IT buyers also evaluate their prospective vendor's blade management capabilities; the ecosystem that surrounds their potential blade choice and the vendor's track record in blade innovation; and the vendor's blade roadmap. We believe that, after considering these elements, IT buyers will agree with us: that blade decisions should not be made on specifications alone.

Blade Background Information

Before buying a blade system, prospective blade buyers need to weigh the pros and cons of blade architecture.

On the "pro" side, blades:

- cost less than equivalently configured rack servers (once the cost of the enclosure is offset – which is approximately after the fifth blade is installed);
- can significantly lower deployment costs (largely because the backplanes in the chassis replace external switches and cabling – serving to greatly simplify installation);
- help reduce management costs (this topic is discussed in greater depth later in this report);
- serve to increase utilization rates (most blade vendors have a strong focus on virtualization – a method of pooling unused resources. By pooling these resources, IT buyers can increase the utilization rates of their information systems – realizing better total-cost-of-ownership as compared with distributed tower or scale-up systems that are often heavily underutilized);
- decrease facilities costs (especially real estate costs due to blade density); and,
- reduce corresponding service costs (due to less complexity).

On the "con" side, blades have faced some interesting design problems – mostly problems driven by the need to reduce power consumption and dissipate heat created in densely-packed blade chassis. So the two biggest design challenges in blade server architecture are to 1) limit power consumption in order to generate less heat; and, 2) heat displacement (otherwise known as cooling).

To deal with heat generation resulting from power draw, the computing industry shifted away from increasingly hotter and hotter uni-processor designs, instead moving to lower clock-rate multi-core chips to deliver more computing power. Further, the industry has focused on reducing the power consumption envelopes of newly designed multi-core microprocessors – thus mitigating blade power/cooling issues to some degree. And new designs look even more promising, (Intel recently announcedt that it has developed an 80 core design that may draw less than today's quad-cores).

To cool densely-packed blade environments, blade makers have also focused on building fan management features into their blades, as Hewlett-Packard (HP) has done with "cool fans", and IBM has done with "Cool Blue". IBM has even reintroduced a water cooling system to help draw heat away from its blade chassis (by the way, water makes a far better conductor than air – so water cooling is an excellent idea for some datacenters). Further, some blade vendors provide systems management packages that can monitor blade usage and even quiesce blades that have become overheated – reassigning their workload on-the-fly to other less-burdened processors.

Power draw and heat dissipation will remain major blade design challenges for years. But with better microprocessor designs; innovative cooling approaches; and intelligent, automated management, power consumption/heat dissipation issues are being mitigated today.

Choosing Your Blade Vendor: Beyond Specmanship

Specification sheets (spec sheets) abound in the blade marketplace. And these spec sheets have all sort of useful information about a given vendor's blade such as the processor speeds, internal bus speeds, cabinet dimensions, number of slots available, fans and power supply information, network plug-in module options, and so on.

But *Clabby Analytics* asks IT buyers to consider more than specmanship when choosing your blade environment. Prospective blade buyers also look at vendor's:

1. Blade management environment (particularly at monitoring, control, virtualization and provisioning functionality);
2. Ecosystem (especially, how many vendors are participating in that vendors blade development efforts – and how soon that vendor is able to bring advanced functionality to market based-upon its partner's technologies); and,
3. What does your prospective blade vendor's strategic roadmap look like?

The following subsections will consider each of these points in greater depth.

Blade Management

First, it should be noted that there are many types of blades, including server, client, storage, and network blades. Of these, server blades dominate the blade market.

Given that there are many types of blades, IT buyers need to consider blade management from two perspectives:

1. How to manage server blades most effectively; and,
2. How to manage a mixture of blade types over time (such as server and storage blades).

Managing Server Blades

With respect to managing server blades, blade buyers need to understand that all major blade vendors offer basic monitor and control functions for their blades. But there are significant differences amongst vendors in the types of tools that can be used to monitor server blades – and in what those tools can deliver. For instance, IBM offers an in-depth tool called Power Executive that can provide information on blade power draw and power usage, as well as workload modeling capabilities. Other blade vendors do not provide this level of detail or control – but may differentiate in other areas. So as prospective blade buyers evaluate the management facilities and offerings of the various blade vendors, Clabby Analytics suggests that prospective blade buyers pay particularly close attention to:

- *Monitor and Control Capabilities* – Can the vendor isolate which blades are being used for what purpose; what the load is on a given blade or group of blades; heat dissipation characteristics such as what the temperature of a particular blade component or what is the temperature within a given blade enclosure; and so forth;

- *Virtualization Capabilities* – How easy (or complex) is it to create pools of virtualized resources? Can the vendor (or its independent software vendor – ISV – partner manage pools of systems and storage from the same console? And,
- *Provisioning* – Provisioning has to do with building-up or tearing down resources to adjust to variable workloads. And some of the industry's most advanced provisioning is taking place on blade platforms. To get maximum utilization out of your blades, you'll need to ascertain how easy it is to provision blades to adjust to different workloads. Further, the better provisioning environments offer automated provisioning capabilities based-upon executing predefined scripts that take specific actions based upon predetermined procedures. One of the strongest benefits of blades is to help reduce management costs – and a strong focus on automated provisioning will go a long way to help reduce people-related blade management costs.

Managing a Variety of Blades

Blade management is no longer just about the management of blade servers. As new client and storage blades come to market, IT managers need to plan for integrated blade management of all blade devices (this particularly includes blade servers and storage). Blade buyers should look for vendors that can provide access to a common management environment with a common graphical user interface that can monitor and control all blade devices within a given datacenter. (Note: today, servers are mostly managed separately from storage, which are frequently managed separately from networks – and all are usually managed separately from clients).

Expect that resource management and utilization will remain the focus in blade management — with particular focus on virtualization and provisioning software. Vendors that can create graphically driven resource management packages that offer strong monitor, control, virtualization and provisioning capabilities across both systems and storage will be the ones to win big in blades over time.

Closely Examine Your Prospective Blade Vendor's Ecosystem

Who would have ever have thought that such a simple, mundane, basic design — a chassis with an internal communications backplane that can hold a variety of different types of blades (server, storage, and client blades) and other modules (such as networking modules) — would have such a huge impact on innovation in the computing industry? But, upon closer examination, the blade chassis is a game changer — an important, strategic element that provides the critical backbone upon which to host new technologies from a variety of vendors (an ecosystem of vendors). Blade enclosures help:

- Foster innovation (because entire communities, not just individual vendors, can build products to fit in blade enclosures);

- Reduce system design costs for 3rd parties — enabling them to focus on building value-added components rather than whole systems. 3rd parties need only invest in building their own server, storage, or client blades or in building networking modules — the rest of the development expense (development of the chassis, the power/cooling scheme, and the internal switching) is borne by the blade enclosure maker.
- Open-up new markets for blade vendors. Specialized blades can help vendors sell into new markets such as telecommunications, high-performance computing, and small and mid-sized business (SMB) — markets that they may not have been able to serve with scale-up and/or rack designs.
- Lower acquisition, deployment, and operational costs for buyers because internal blade switches eliminate the need to purchase external switches and manually cable servers together.

Look closely at your prospective blade vendors ecosystem and you should find a wide variety of products from a number of sources including high-speed switches from networking vendors; a variety of microprocessor options such as field programmable gate arrays (FPGAs), and cell microprocesors from various chip makers; storage blades as well as storage subsystems built specifically to support blade environments; and numerous blade management packages available from independent software vendors (ISVs) as well as from the open source community. These vendors and the open source community are helping to drive innovation in the blade market by working aggressively to integrate their latest/greatest technologies and products within various blade vendor's chassis.

Blade enclosures are strategically important to blade makers and to 3rd party hardware manufacturers. Blade makers use their enclosures to innovate in the areas of power consumption, cooling, management, and networking speed to create competitive differentiation. 3rd party hardware makers leverage blades to reduce entire system design costs — as well as support and quality assurance costs. Hence, the ecosystem that surrounds a given vendor's blade enclosure should be a primary consideration when choosing a strategic vendor partner.

Blade Strategic Roadmaps

Finally, when choosing a blade vendor, examine that vendor's strategic roadmap for its blade technologies. Pay attention not only to what the vendor is doing in server blades, but also in storage blades – particularly in network attached storage (NAS) and storage area networks (SANS). Further, your vendor's client blades strategy should be examined (particularly if your organization leans toward centralized control of desktop/workstation resources). And look closely at not only which partners your vendor is working with in the networking arena, but also where that vendor is in the pecking order in terms of releasing advanced networking technologies on its respective platform. (The vendors with the highest blade volumes tend to get advanced technologies well-before second tier vendors).

The Blade Server Roadmap

When evaluating a vendor's blade server roadmap, consider that industry standard, general purpose x86- and x64-based servers are available from dozens of sources. And powerful 64-bit RISC (reduced instruction set computing) blades are available from IBM and Sun. 64-bit EPIC Itanium blades are available from a number of sources including HP, Unisys, and Egenera. Blades that use field programmable gate arrays (FPGAs — another type of processor) are available from Interactive Circuits and Systems, Silicon Graphics, and NALLATECH, amongst others. And cell-based blades from IBM (as part of its partnership with Mercury Computer Systems) have arrived.

Most of today's blade server activity takes place on 32-/64-bit "industry standard" (Intel Xeon/AMD Opteron) servers, so the processor roadmaps for these types of blades are fairly well known. In essence both companies are currently focused on shrinking processor gates using a 64 nanometer manufacturing processes (future years will bring further miniaturization) to increase processing yield and decrease energy consumption. To further increase processor speed, each company is also focused on placing more processor cores on a die (dual-core, quad-core, and so on).

When considering RISC blades, the big news on the RISC side-of-the-house will be the arrival of IBM's POWER 6-based blade with processing speed to be in the 4-5 GHz range (more than likely available within a year). Further, Sun is expecting to greatly increase blade processing capability using its CMT (chip multi-threading) technology.

SGI, on the road to recovery after its recent bankruptcy filing, is becoming more aggressive in the FPGA marketplace. Meanwhile, other vendors have entered the FPGA blade market, most notably NALLATECH.

NALLATECH, a Scotland-based maker of FPGAs, is using IBM's BladeCenter enclosure as the basis upon which to deploy its FPGA blades. By so doing, NALLATECH does not have to build a complete system in order to bring its FPGA to market. It can rely on IBM to build and test its own enclosure, power and cool that enclosure, and innovate in network design and storage integration within that enclosure. NALLATECH needs only to build what it is good at — FPGAs on a board. Accordingly, NALLATECH doesn't have to spend tons of research and development euros building and testing a complete system. Nor does the company need to build a large support staff to support IBM BladeCenters (support is available from IBM as well as from a number of 3rd party solutions providers). And because IBM's BladeCenter sells in large volumes, NALLATECH can take advantage of BladeCenter economies of scale which translate into lower build costs for a complete system (and lower purchase prices, therefore, for NALLATECH customers).

As for the future in blade servers, the same approach that NALLATECH has used can be used by any maker of specialized processors to bring their product to market more quickly and less expensively than having to build/support an entire blade environment.

This ability to incorporate numerous, different types of processors, gives blade servers great flexibility. This flexibility will be used over time to enter new markets where specialized or hybrid processors may be

exploited to gain competitive advantage. Meanwhile, multi-core processing can be expected to greatly increase the processing power of blades — posing a real threat to scale-up computing designs.

The Storage Blade Roadmap

As for storage blades, the whole idea behind a storage blade is to put as much storage as possible in cache as near to a blade server as possible to speed input/output and thus speed processing. Today, storage blades have been introduced by HP, IBM, and other vendors specifically to put storage resources close to blade servers such that the servers can handle data intensive applications.

One idea that is currently being discussed in blade storage is the creation of "storage sidecars" — network attached storage (NAS) blades in a cabinet that can be linked in a tightly-coupled fashion to the communications backplane of a blade server. Sidecars could help speed up data serving to blades without necessarily having to be located within the chassis. Another idea on the table is the creation triple-height storage blades that can deliver as much as 3.5 terabytes of sharable storage within a blade enclosure.

The Client Blade Roadmap

Imagine a stock broker or product designer who has several workstations and/or PCs in his/her workspace — all generating heat. By placing workstation blades in the datacenter away from workers, heat can be dissipated more efficiently while also allowing centralized management and security under the control of the datacenter.

Putting a workstation or a PC on a blade is not tremendously complicated. And switches are available to provide keyboard, video, and mouse services using Ethernet to connect to the datacenter where client blades are housed. But building the management environment to manage potentially hundreds of PC or workstation blades can prove to be a real challenge. Terminal server software (such as that provided by Citrix, Microsoft, and others), however, is proving to be ideal for the centralized management of client blades.

Expect innovation in workstation and PC designs as multi-core processors make the client blade scene. And expect most of the innovation in this space to occur on the management side as blade software vendors seek to build monitor, control, and security software to manage large client blade environments.

The High-Speed Networking Roadmap for Blades

High-speed 10 gigabit (GB) Ethernet, Infiniband, Fibre Channel, and Myrinet interconnects are all available now on blade architecture. But when it comes to networking, more choices is not necessarily a good thing as blades could operate more efficiently if a common fabric was used inside and outside of the box rather than having to rely on a conversion/gateway activity when bridging from one type of

network to another. So instead of a great deal of innovation in high-speed networking (in essence, more choices), the industry might be better served by standardizing on fewer high-speed network choices.

From our perspective, blade computing could benefit from a single network type dominating the industry (just as the industry benefited when 802.3 Ethernet beat out 802.5 token ring as the dominant LAN networking scheme). We expect that blade vendors to push for a ubiquitous fabric running from internal blades to external devices — most likely 10 GB Ethernet. Depending upon your application requirements, Infiniband, Myrinet, or other high-speed options may be appropriate. But, if possible, consider leaning toward 10GB Ethernet both inside and outside of the chassis.

Summary Observations

Blade architecture is amazing. It is an architecture that is simple in its design, but can be used to deliver some of the world's most powerful, flexible, and innovative systems. It all starts with blade enclosures that have become the base for new, innovative designs in servers, storage, and client devices. An ecosystem of hardware and software vendors build their products into that enclosure design – greatly expanding the kinds of things that blade architectures can do.

IT buyers who fail to recognize that there is far more to blade architecture than just speeds and feeds (processing power, networking speeds, and benchmarks) may be selling themselves short. Given the rapid pace of innovation on blade platforms, failure to pay attention to the "rest of the picture" – by choosing the wrong vendor based upon speed-and-feed specifications – can result in getting blade innovations months later than product become available from the leading blade vendors. Or it could mean that new designs (such as cell-based blades, or FPGA-based blades, or client-based blades) are not available at all.

When choosing a blade vendor, *Clabby Analytics* strongly recommends that IT buyers look beyond the specs, and pay especially close attention to a given vendor's:

1. Blade management products;
2. Ecosystem (partners and priorities); and,
3. Strategic roadmap.

By so doing, we believe that IT buyers will be able to recognize the full benefit of their investment in blade architecture.

Clabby Analytics
http://www.clabbyanalytics.com
Telephone: 001 (207) 846-0498

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