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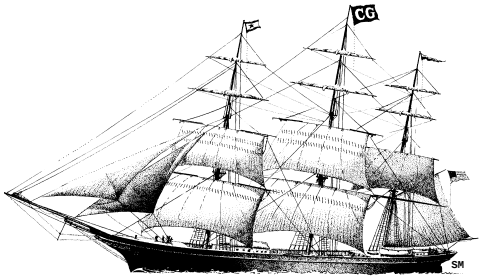

Navigating Information Technology Horizons℠

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IBM BladeCenter — A Glimpse at the Future of Computing

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Management Summary

Discussed and developed for years, blade architectures have been long anticipated. But there is more here than meets the eye. The vertical format of server/storage/network/specialty blades mounted in a horizontal chassis contrasts easily with the horizontally-encased older brethren mounted in vertical racks. This visible dimension of blade computing is important because of its greater density and reduced hardware costs. However, **a less visible dimension of blade computing is an even more important and profound change, to both technologists and to those paying for IT infrastructure**. *If what you can see is all there is, you are missing the point.*

Every once in a while, there is an opportunity to rethink what is important and redefine the vehicles for optimization. We've been on the smaller, denser, faster, cheaper autobahn for some time – to the point that, at least in the PC space, we no longer know how to use the power that is now available at rapidly decreasing price points. So if blade products only travel the same path, enterprises might see them as just another vehicle to deliver computing/storage/networking at a lower acquisition cost, one that can easily be deferred until more prosperous times. *That would be too bad, because there is much more potential to blades than meets the eye.*

Think about blade products this way: *If done right, it's not what you do with them that defines the value proposition, it's what you, as an enterprise, don't have to do that makes the proposition so attractive*. **IBM's recently-announced *BladeCenter* gives you a lot not to do, so much so, that we recommend that you consider implementing this class of technology sooner, rather than later; it will pay for itself quickly.** The additional savings come in many forms:

- Ability to consolidate the work of many servers onto fewer servers
- Ability to do this in significantly less space, with less electrical consumption and cooling costs
- Ability to install blades with minimal cabling between blades and networks and peripherals
- Ability to flexibly configure, and reconfigure, the operating environment of each blade to suit the current need
- Ability to scale growth and customize the mix of blade types within a chassis, and in additional chassis
- Ability to apply policy management techniques to blade configuration, use, and recovery – and, ultimately, to optimization
- Ability to manage workloads automatically
- Ability to do all of this with much less labor – technical, administrative, and operational

The result is the answer to many of today's big IT infrastructure challenges. Read on to find out how and why.

IN THIS ISSUE

The World According to IBM

Through its Project Eliza, IBM has said a lot about its view of the future of enterprise computing:

- Self-exploring
- Self-configuring
- Self-managing
- Self-monitoring
- Self-healing
- Self-optimizing
- All within policy parameters specified by the enterprise

All of this speaks of a need to enhance/replace less-efficiently deployed resources with those that are more efficient. This means getting more value for investments in capital resources plus far greater productivity from the human provisioners and caretakers. None of this should be a surprise; many of us have been through this cycle before. It's just that it is more visible in a down economy, when resources are tight and sensitivities are heightened.

So what does this have to do about server architecture and what is different about IBM's *BladeCenter*? While other vendors are trying to get the blade hardware right, IBM has realized that this is just the first ante in a very high-stakes poker game for doing it right, that is, delivering a Royal Flush to the larger enterprise, just at a time when it needs it most. This means addressing all of the issues bulleted at the left to create a coherent solution that maximizes ROI well into the future. Not that it is all here, but **there are signs aplenty that IBM has designed BladeCenter to be part of a grand computing solution**. Even though it is quite nifty at the component level, **BladeCenter presents – and maybe even forces – a great opportunity to rethink how computing will be done in the larger enterprise, in general, and in your enterprise, in particular.**

If you think that you are not ready for this reassessment, think again. While the benefits of BladeCenter at the outset may justify a rapid deployment because the ROI is so outstanding, you should not go swiftly down this path without considering the many other implications to the way that you currently provision your IT infrastructure. Don't take this as an instantaneous conclusion that you can dispose of your existing SMP and rack mount servers, switched networks, and monolithic storage infrastructure with abandon. **But once you see the light, you will know that BladeCenter and an across-IBM focus on autonomics will change almost everything, given enough time.**

Steps for Shrinking The Processing Environment

1. Take the processing power of blades and faster chips
2. Add the ability of workloads to share a processor and, later, to spread workloads across a dynamically-configured multi-processor/multiblade domains without an SMP architecture
3. Add grid-like processor aggregation, giving the ability to deploy workloads across fractions of processors greater than one
4. Add in self-managing nodes and unified workload management, to allow work-loads to be deployed opportunistically to meet service level agreements
5. Add storage blades and consider denser storage in the offing. The environment may have shrunk and speeded to the point where the NUMA issues of distance may be removed by an internal bus
6. Look forward to the maturing of Web Services and the increasingly inter-connected modules of applications that support business processes, and **doing it all in a very dense compute environment becomes very attractive.**

BladeCenter — The Solution

This change is driven primarily by the density of the BladeCenter and the installability of blade "personalities[1]," and unified management of the entire environment that it enables. In the not-too-distant future, as multiple dozens of applications run

[1] Linux and open standards increasingly allow operating system and application to be run on assignable, rather than dedicated assets. An IBM blade can be provisioned with an OS and application in under five minutes.

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The BladeCenter Hardware

BladeCenter's 7U chassis (enabling 6 chasses to the rack) provides unified power and cooling. Shared use of the chassis' CD and floppy drives is arbitrated by chassis software.

There are up to 14 blades per chassis, each with two 2.0 or 2.4 GHz *Xeon* processors. This number will grow, to four and eight processors per blade. The blades can run Windows, Linux operating systems at launch, and Novell by year-end. More operating systems will be added. Each blade also has an additional service processor, with its own power feed and gigabit Ethernet connection, from which it feeds information to the management module in the chassis. Should the blade fail, the service processor can still be accessed for the information needed to fail-over to another blade.

A mid-plane provides two paths to all critical functions. Think of it as an internal high-speed LAN. On the back-end, two optional Fibre Channel switches in the chassis allow integration with SANs. In addition, there are two Gigabit Ethernet switches with Layer 2 protocols; Layer 4 will be added next year. Management of these switches is part of the chassis management function.

in a chassis (with partitioning they can share a blade), the management and optimization of that chassis becomes critical – and too complex to be managed manually. The policy-driven automation of *IBM Director*, *Enterprise Workload Manager (eWLM)* and the self-management capabilities of the blades then come into play to enable the flexibility that wasn't achieved by over-provisioning.

There will be increasing heterogeneity on multiple levels as BladeCenter goes forward. Blades are now targeted at simple gateway applications like Web serving. As four- and even eight-way blades are developed, there will be fewer constraints on "what can run on a blade." **With partitioning, virtual machine technology and various processor aggregation technologies, the shackling of a blade to a single application, or an application to a single blade, will cease.** Then, the potential consolidation play of running most, if not all, of a business' applications in a single rack, particularly with the ability of Web Services to enhance the inter-functionality of those applications, is compelling. The development of diverse blades (employing different processors, like *Power4*[2]), or special-purpose blades[3] in a highly tunable environment (supported by distributed management and autonomic capabilities) will lead to tailored optimization for different kinds of workloads. **Smart, dynamic, dense blades, as opposed to dumb, dense, but simple blades, will make a critical difference in product functionality.** If you think this is beginning to look like a huge, co-located grid, you are right. Then you can add distance to the equation by installing BladeCenters at multiple locations, which many enterprises will want to do. **All of a sudden the hardware – aggregatable and partitionable as needed – will become invisible to the user.**

For integration of multiple blades to support parallelizable workloads, *CSM* (*AIX*'s *Cluster Systems Management*) will be added, later this year, as a plug-in to IBM Director in *Linux* environments, creating traditional clusters. In *Windows* environments, *MSCS* can be used for the same purpose. By early next year, partitioning software will allow subdividing of processors in blades for multiple workloads. The partnership with *VMWare* gives this functionality in Windows environments immediately.[4]

An Important, Partnered Strategy

Development of the BladeCenter has been a multi-year effort for IBM. BladeCenter is a critical proof point of IBM's Autonomic Computing initiative. This is significant. IBM will sell BladeCenter through its traditional VAR channels and distributors.

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[2] Imagine a blade running AIX or iSeries applications.

[3] Consider special blades for NAS enablement, global file systems, virtualization, etc.

[4] See *The Problem of Application Sprawl — VMware ESX Server is a Solution* in **The Clipper Group Explorer** dated May 22, 2002, at www.clipper.com/publications.htm.

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BladeCenter's Infrastructure and Management Software

IBM Director was developed to configure and boot remote PCs in a distributed environment. Extensions to its capabilities and the *Enterprise Workload Manager* announced by IBM in May 2002 are the basis for both the chassis management and the server appliance, which backs up BladeCenter chasses.

The BladeCenter's management capabilities span traditional fiefdoms of application, network, server, and storage. Much of the administration now can be automated, and there is a consistent interface to operations, support and maintenance of the system as a whole. The management is a tiered, but federated approach. Each blade has two processors as well as a service processor, by which it manages itself according to basic policies, feeding information upwards to the intelligence in the chassis, and thence to broader network management and reporting frameworks. The chassis' own intelligence provides an intermediate, 14-blade point of asset aggregation.

While a two-disk SCSI storage blade is offered, IBM expects most customers to attach to existing NAS or SAN storage via 1GB Ethernet or 2GB FC ports.

In addition, Intel will take the BladeCenter to market through its OEMs. This multi-branding will drive the BladeCenter approach as a new way to do enterprise computing. **Quickly the architecture will become a *de facto* standard.**

IBM Global Services will be providing BladeCenter services on a rate-card basis. IBM Global Financing will be providing leasing schedules for both chassis and blades, which will be treated separately, and IGF will work to transition your investment in older rack-mounted server farms to the new blades.

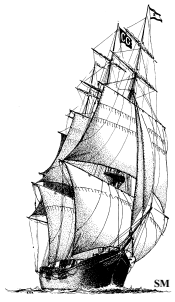
At launch, the BladeCenter Alliance program had 57 partners including:

- **Adaptec** -- HBAs and gateways
- **Broadcom** - communication; see also its subsidiary ServerWorks below
- **Citrix** - thin client/portal solutions
- **Coalsere** - server clustering and storage virtualization
- **D-Link** - Switches
- **Data Synapse** - distributed computing platform
- **F5 Networks Software** - Blade controller
- **IBM Tivoli** - systems and storage management
- **Intel** - microprocessors and PC boards
- **Lotus** - office productivity
- **Microsoft** - operating systems, office productivity
- **Nortel Networks** - embedded LAN switch
- **Novell** - distributed server environments
- **PolyServe** - matrix computing
- **Qlogic Corporation** - HBAs and switches
- **RealNetworks** - streaming
- **Red Hat** - Linux
- **Resonate** - diagnostics
- **ServerWorks** - high-performance integrated circuits
- **Sphera** – web-hosting automation and management
- **Tesseration Games** - multi-user interactive games
- **Think Dynamics** - blade server provisioning and management
- **VMWare** - virtual machines for processor partitioning, provisioning and software management
- **WebSphere Software** - application development and integration platform

Conclusion

The ROI is compelling. BladeCenter is an environment that minimizes the need for space, power, and the time of human administrators to administer routine tasks. The result is enormous capability for less cost and effort.

The longer-term capabilities of this architecture, and the technologies which play into it, make a move to this architecture not just a quick fix for economic woes, but the right thing to do for the longer term.



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