CLABBY ANALYTICS

Commentary

The Data Center 'Implosion Explosion' … and the Need to Move to a New Enterprise Data Center Model

Introduction

In recent years, there has been an explosion of imploding data centers. Crushed by demands for increased services — and flattened by greatly increasing operational costs — data centers are collapsing under their own weight. Information systems labor costs can now represent up to 70% of an information technology (IT) operations budget; power and cooling costs are now 8X greater than a dozen years ago; and pressing security and compliance demands have drained resources and the funding needed for new projects. Innovation is at a stand-still.

The reasons for this implosion are related to aging data center infrastructure and operations models. Data centers that use outdated models for program-to-program interaction and data sharing are unable to adapt to constantly changing service demands due to application interoperability and data sharing problems. Data centers that have not been consolidated and virtualized have become operational sinkholes from a management and resource utilization perspective.

Aging data centers are broken and need to be transformed. More specifically: 1) service management has to be incorporated as part of the underpinning to ensure quality service delivery; 2) data center operational costs need to be reduced through consolidation/virtualization; and, 3) data center infrastructure needs to be restructured to be more dynamic in order to more readily adapt to constantly changing service demands.

The remainder of this *Commentary* examines the "whys" and "hows" of data center transformation. *Clabby Analytics* (that's me) explores the market trends that are driving enterprises to transform their data centers. In this report, I compare and contrast the current data center model to a "dynamic and service oriented" data center model. I also describe the phased approach that enterprises are taking as they transform their data centers — and provide background component blueprints that can be used as a basis for architecting the service oriented data centers. Finally, I provide my perspective on why I believe IBM is better suited than HP, Sun, Dell or Cisco to help enterprises design and deploy the enterprise data centers of tomorrow.

Why Transform Your Data Center?

There are four forces that are driving the move to a new enterprise data center model:

1. Operational challenges (cost, security, resiliency, and environmental factors);
2. Business initiatives/imperatives (the need to innovate); and,
3. New technology drivers (Web 2.0, mash-ups, cloud computing, etc.).
4. The need to rapidly deliver quality service.

Operational Challenges

The first major reason to transform your data center is to reduce out-of-control operating costs. Human-related management costs are now the single largest expense in the data center. Energy costs are soaring as global competition for energy resources drives power and cooling costs through the roof. Enterprises across the globe are being compelled to comply with standardized financial and operational practices (compliance). Businesses have a financial, legal, and moral responsibility to protect employee, customer, and partner data (adding additional cost for security and data retention). Thanks to the ever-increasing amount of data, the growing number of connections to that data, and the expanding number and variety of devices being used to access that data — data management has become a major operating expense. These costs need to be brought back under control.

> ***The keys to reducing data center operational costs are "simplicity" and "efficiency". By adopting a dynamic and service oriented model and architecture, enterprises can simplify their information systems infrastructure (this, in turn, can lead to greatly reduced human-related management costs as well as greatly improved service levels). And, by consolidating systems, servers storage and networks — and further, by creating large virtualized pools of logical and physical resources — enterprises can significantly reduce IT operational costs (consolidation and virtualization lead to improved systems/storage utilization rates; lower systems/storage management costs; and simplified systems failover, testing, and quality assurance).***
>
> ***The key to driving simplicity, agility and efficiency in the data center is service management (management services that provide businesses the ability to see their operations/businesses, control risks and manage compliance, as well as leveraging automation).***

Business Initiatives/Imperatives

The second major reason to transform your data center is to free-up funding for innovation. In order to respond quickly to changing marketplace conditions, to gain competitive edge, to serve customers better, and to streamline supply chain interaction, enterprises constantly need to innovate. Innovation usually involves process change, often involves exploiting new technologies — and almost always requires funding for new application code.

> ***Funding for innovation is being eroded by ever-increasing operational expenses. In order to foster innovation, data center operational costs need to be decreased and savings need to be reallocated to support innovative new initiatives. Automation at all levels, including process automation to drive consistency and streamlining operations, is critical.***

New Technology Drivers

The Internet standardized communications between information systems. Increased speed and bandwidth are now creating new opportunities to drive new, service oriented applications over the Internet backbone. Standards for program-to-program communications (Web services) have helped overcome program-to-program interoperability issues. Standards for data sharing (XML) have knocked-down data sharing obstacles. And all of these technologies are making it possible for enterprises to implement new, service oriented applications.

Thanks to these standards, a whole new generation of dynamic, Web-based, service oriented applications is developing. These applications are leading to the creation of innovative, collaborative environments where data can be shared and programs can interact easily. And as a result, innovative new application solutions are being brought to market more quickly than ever before. It should also be noted that a Web-based design requires robust management to ensure service performance and availability.

Why is a New Approach Needed?

In the not-so-distant past, applications were written in a tightly-coupled (closely tied together) manner. When an application needed to interact with another application, developers would hard code where the corresponding application could be found, and dictate what result(s) it was to supply. Communications between applications were often conducted over distributed, proprietary networks (typically SNA, DECnet, and/or VINES) — and application programs "talked" with each other using proprietary interfaces (such as LU 6.2, CPI-C, NETbios, etc.). Application code could be described as "monolithically intertwined", and the introduction of variants into an application process could break an application's ability to complete a task. Failure to use the same proprietary program-to-program interface prevented applications from interfacing. As a result, applications were inflexible — and maintenance of these tightly controlled environments was costly and time consuming.

The introduction of object-oriented programming; the creation of standard program-matic interfaces (known as "Web services"); the introduction of standard formats for data sharing (XML); and the use of Internet Protocols (IP) as a common basis for network communications broke down impediments related to program-to-program communications, data sharing, and networking. Using these standards, applications could easily "talk" with each other and make requests for services, or respond to service requests.

As a result of the combination of these technologies, a new generation of highly-flexible cooperative applications has evolved and is evolving (see Figure 1).

Figure 1 —New Technologies To Be Harnessed

Source: IBM Corporation — February, 2008

Examples of these new, flexible, service oriented applications include Web 2.0 applications (such as blogs, wikis, social bookmarking, RSS feeds), and mash-ups (Web applications with origins from more than one source that combine to create a result). Further, these new standards have enabled a myriad of object-oriented third party independent software vendors (ISVs) to write applications that communicate freely with applications and databases provided by other vendors. Programs created using these new programming models give enterprises great flexibility when designing application solutions; enable enterprises to respond quickly to changing market conditions (such as new customer requirements or new competitive pressures) — and the underlying consolidated/virtualized infrastructure provides these applications with great scalability.

By adopting a dynamic, service oriented architecture, enterprises gain a great deal of flexibility when it comes to building applications that can respond to constantly changing business needs. Using SOA, enterprises can more readily respond to the interoperability challenges that stem from the worldwide trend toward globalization and can adapt and innovate more rapidly than using the tightly-coupled architectural approach of the past.

> ***Observation: Service oriented architecture is making it possible to create a new generation of cooperative applications. These applications are driving the need for greater data center flexibility, scalability, and responsiveness — and, as a result a new enterprise data center model is needed to serve this new applications model.***

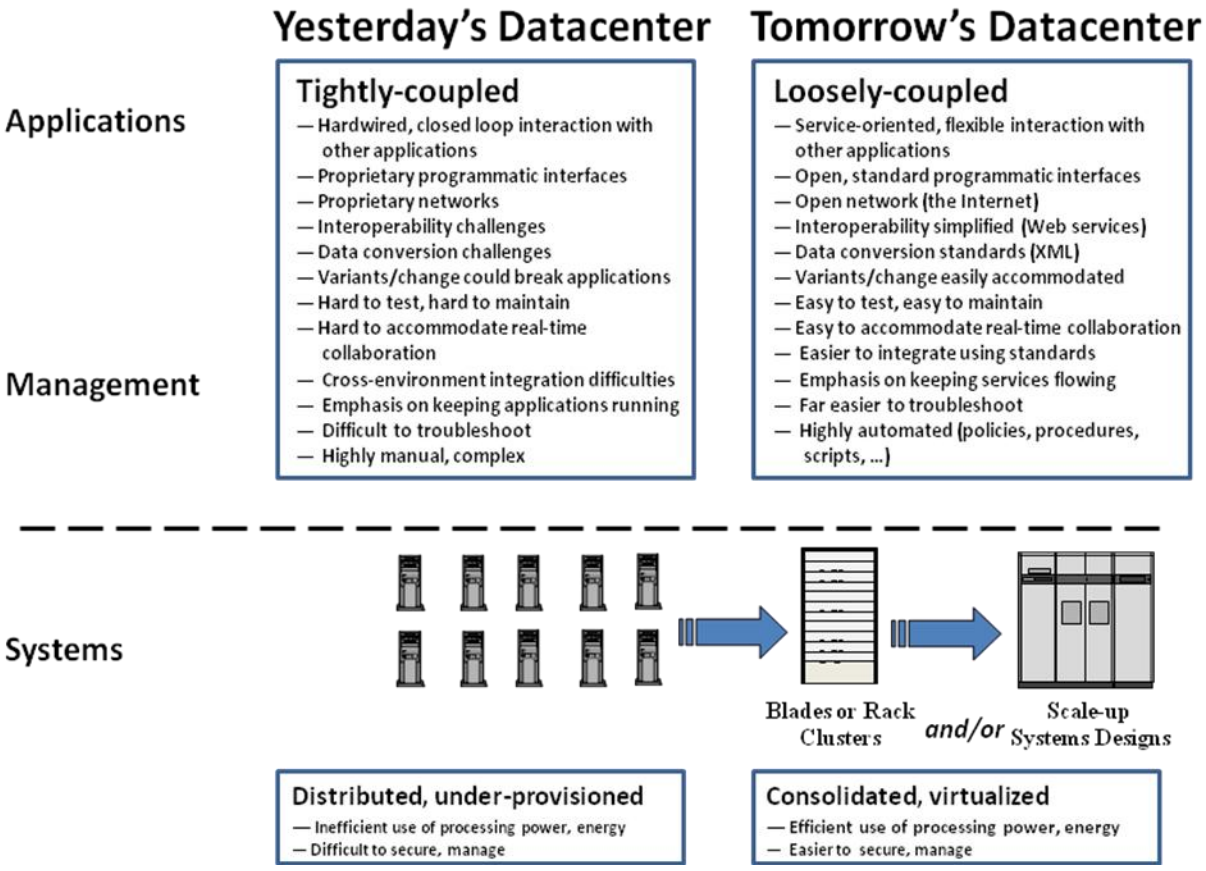
How is the New Enterprise Data Center Model Different from its Predecessors?

The primary differences in the data center design of yesteryear, and the emerging dynamic and service delivery design of future data centers can be found in application behavior (tightly-coupled vs. loosely coupled); application management (applications/systems focused vs. systems efficiency/service delivery focused), and information systems optimization (moving from under-provisioned server farms to highly optimized, virtualized scale-up and scale-out architectures). Another distinction is how management has evolved from that of systems-based to business-driven in the new world. Service management is included and enforced by strategic design.

Figure 2 (next page) provides an overview of the comparative differences between yesterday's data center design and tomorrow's new enterprise data center designs. Note that the primary differences are:

1. A move from a tightly-coupled programming model to a loosely-coupled Web services model;
2. A new emphasis on the management and automation of services; and,
3. Consolidation of distributed systems environments combined with the virtualization of information systems resources (systems, storage, networks, applications, databases, and so on) to reduce data center operational costs, increase systems utilization, reduce power draw, lower management costs, and to simplify testing.

Figure 2 — Yesterday's vs. Tomorrow's Enterprise Data Center Design



Source: Clabby Analytics — February, 2008

How are Businesses Building The New Enterprise Data Center?

Five years after IBM announced its on demand vision — and after years of development, experimentation, and integration work — the elements needed to build new enterprise data centers have become well-known, well-tested, and relatively straightforward to deploy. In fact, IBM has a well defined architecture, implementation patterns and blueprints to help clients transform to this new model that supports business, management, development, and infrastructure services.

Three Phases of Adoption

In general, there are three phases (stages of adoption) involved when moving toward the new enterprise data center model:

1. Simplified;
2. Shared; and,
3. Dynamic.

The characteristics of each approach are illustrated in Figure 3.

Figure 3 — Three Stages of New Enterprise Data Center Adoption

Stage	Simplified	Shared	Dynamic
Key point	Drives IT efficiency	Rapid deployment of new infrastructure and services	Highly responsive and business goal driven
Characteristics	• Physical consolidation • Virtualization of individual systems • Systems, network and energy management	• Highly virtualized infrastructure – "ensembles" • Central management and automation • Green by design	• Virtualization of IT service – "cloud" • Business-driven service management • Integration of real-time data and analytics – and a service oriented delivery of IT
Benefits	Delivers **new economics** associated with consolidation and virtualization, of data centers and infrastructures, integrated and consolidated management and controls, and increased resiliency and security	**Speeds deployment** of infrastructure and services with highly virtualized resource pools, optimized and converged networks, policy based automated service management, and an underlying green design that effectively **supports expansion and transformation.**	**Drives business goals** [forward] with highly virtualized IT services (cloud), energy-efficient operations across converging IT and physical assets, embedded supercomputers and real-time processing, and process-driven service level management as defined by business rules
Proof points (examples of success)	Japan Airlines • System outages down 58 percent • IT service interruptions down 39 percent • Time to recover from outages down 80 percent	Aiso.net • Data center-wide virtualization • Reduced 100 standalone servers to 4 servers • 60 percent reduction in power and cooling costs through virtualization-based data center consolidation; • Reduced need to invest in server hardware to accommodate customer growth; • 99.9 percent availability through automated failover capabilities; • Estimated 50 percent increase in average server utilization levels	IBM's new Research Compute Cloud (RCC) • Highly virtualized pools • Automated IT service catalog • Provides IBM researchers with quick responses for IT service requests • IT Service requests in minutes vs. hours or days • Calculated to use 1/20th the power • Takes up 1/20th the footprint
IT behavior	Operational, though simplification	Balance of operational and strategic service oriented	Dynamic, strategic service oriented, business analytics
Where is IT today	30-50% have/are consolidating; a smaller % are doing some level of virtualization today.	Emerging - a few companies and IBM's own IT infrastructure are moving to this type of environment	IBM Research, early customer sites

Source: IBM Corporation — February, 2008

The "simplified" approach to building a new enterprise data is all about addressing the operational issues and driving operating efficiency and freeing budget for new development and innovation. In this phase, IT executives consolidate tens, hundreds, or thousands of distributed, usually well-under-provisioned distributed tower servers into far fewer scale-up symmetrical multiprocessing (SMP) servers or rack/blade scale-out architectures. By doing this, IT managers gain more control of information

resources through centralized management, reduce operational costs (people costs for systems/network/application/database management, physical plant, networking, floor space, etc.). Further, IT managers are able to reduce complexity (versions, licenses, etc.); improve security by reducing multiple access points to few; and improve availability. Domain-specific systems management is prominent in this stage.

The next logical step after consolidating (or even while consolidating) is to virtualize (logically pool) systems, storage, networks, infrastructure, applications, management functions and services. The primary benefits derived through virtualization include decreased management cost (it's easier to manage logical servers than physically distributed servers); increased utilization (provides greater return on investment and helps forestall additional system acquisition); improved availability; and simplified testing (by creating easily-configured virtual test environments).

The "shared" phase is about rapid deployment of infrastructure in support of new services. By creating a shared infrastructure that is highly virtualized and well managed with an IT service management model, business can now deploy new services quickly with efficiencies of scale. During this phase, IT managers focus on integrated service management tools to provide visibility and control of the integrated infrastructure for performance and availability and leverage automation based on policies, e.g., policies to help automate service level agreements.

Some of the activities that commonly take place in the data center during this phase include organizing systems, storage, and network resources into highly-virtualized resource pools (ensembles); focusing on energy/power conservation in the data center (green); optimizing networks, appliances, and hybrid systems for SOA traffic flow; and network convergence (fibre channel over Ethernet).

Also during this phase, enterprises that have consolidated and virtualized their information systems turn their attention to automating workflows and provisioning system resources on-the-fly by building policies and procedures that allow certain applications access to certain resources in a prioritized fashion. By doing this, enterprises start to attack the single largest cost in the data center— human-based management.

After enterprises have consolidated and virtualized resources, and after a SOA infrastructure has been put in place, enterprises are then prepared to drive service oriented applications and orchestrated business processes across a dynamic and highly-optimized underlying information systems architecture — the "dynamic" phase.

Activities during this phase include green operations across converging IT and physical assets; highly-scalable "cloud computing" (immense scaling to meet computationally- and message-heavy computing demands); the embedding of super computers and real-time processing; business-driven service management; and service orchestration. Process automation is leveraged to provide streamlined dynamic service delivery and consistency. Activities in this "dynamic" phase also include leveraging services from outside the walls of the data center by connecting to service clouds within the supply chain (an enterprise set of partners) or across the entire IT landscape.

A Blueprint for Rolling-out a New Enterprise Data Center

The technology at the center of an efficient, dynamic infrastructure is an *enterprise service bus*. This bus provides a pathway between cooperative applications and services. Applications using common programmatic interfaces (Web services) use an ESB to communicate with one another. Further, applications can also make use of extensible mark-up language (XML) to share data over an ESB.

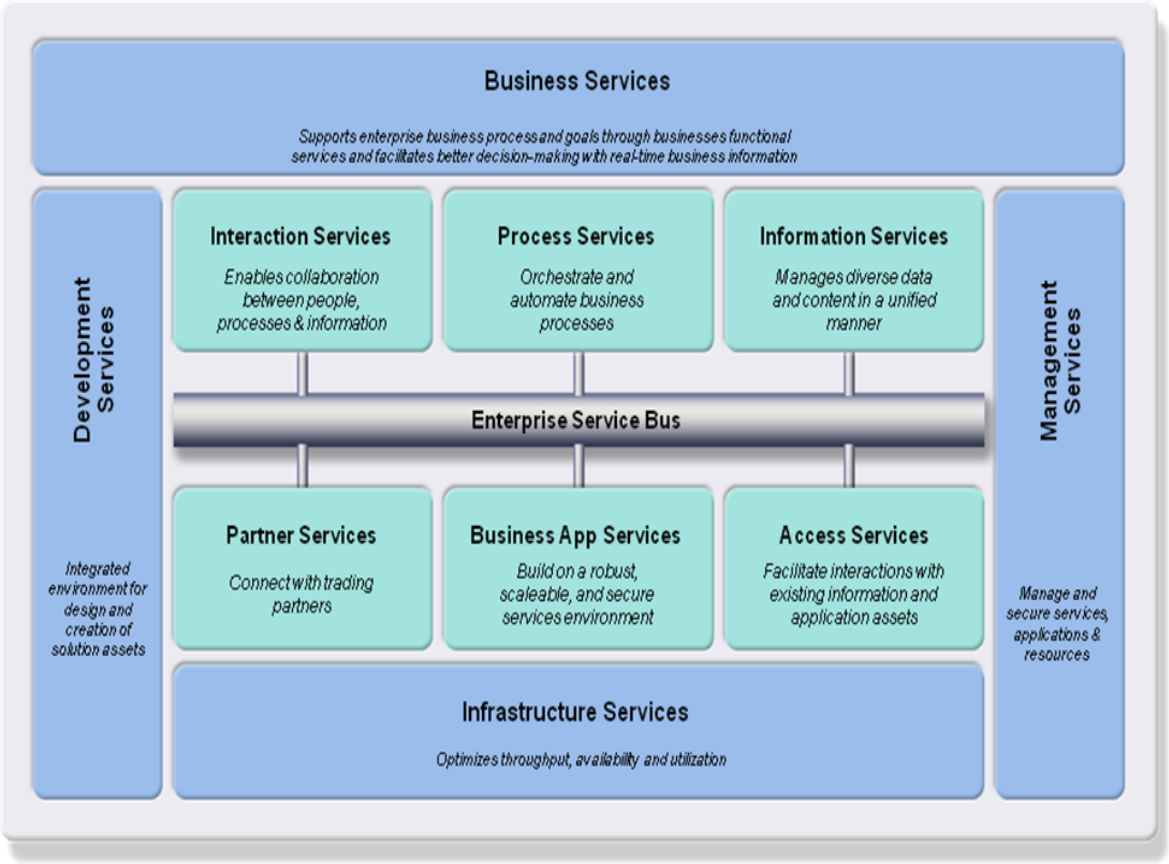
There are four overarching categories of services that need to be driven across an enterprise service bus:

1. *Business services* — these services support business process flows;
2. *Management services* — these services manage and secure applications, resources, and services;
3. *Infrastructure services* — these services optimize systems availability, security, and utilization; and,
4. *Development services* — these services provide an integrated environment for the design and creation of services-enabled applications.

Additionally, there are six basic services that can be exploited to achieve a business result. These include interaction, process, information, partner, business application, and access services.

Figure 4 illustrates the interrelationship of the four overarching services categories to the six underlying service categories that I just described. *Note how services interact with each other across a common enterprise system bus.*

Figure 4 — A Blueprint for Building a New Enterprise Data Center



Source: IBM Corporation — February, 2008

Six Basic Service Categories

The six categories of services (above) can be exploited *in any combination* to obtain a service (or process flow) result:

- *Interaction services* link people, processes and information. For instance, the activity of scheduling can check the availability of meeting attendees, determine a common meeting time, and schedule a virtual or physical meeting place. Notice in this example how various application objects such as individual calendars, conference room availability, and messaging objects all work together toward a common outcome. This is an excellent example of how service oriented applications interact.
- *Process services execute process flows*. Using these services, policies and procedures are articulated — and programs and scripts are written to help automatically orchestrate the flow of work.
- *Information services* manage the presentation of diverse data (digitized voice, video, and other sources) in formats required by requestors.
- *Access services* make data available to properly authorized service requestors on request.
- *Business application services* enable disparate business applications to communicate and share data and results — ultimately contributing to an enterprise view of its own operations. Finally,
- *Partner services* enable trading partners to directly and securely share important marketing, inventory, and distribution data — helping to streamline interactions between an enterprise and its business partners.

Why is IBM Uniquely Positioned to Help Build the New Enterprise Data Center?

The ultimate goal in building a new enterprise data center is to provide a highly-optimized information systems environment that allows for the transparent flow of business processes. This requires in-depth knowledge about how business processes flow; how systems infrastructure can be architected to support these process flows; and how underlying systems can be tuned and optimized to handle a tremendous volume of service requests.

IBM is uniquely positioned to support this type of environment because:

- ***IBM has extensive data center transformation experience. IBM has already engaged thousands of clients, and based upon these engagements, has been able to build replicable, optimized implementation plans and blueprints based upon real-world implementation patterns.***
- ***IBM has a heritage in identifying major market trends (e-Business, on demand computing, Internet, Linux, grid computing, and so on) — and aligning resources to help its customers capitalize on market shifts (IBM has a long heritage in leading market change);***
- ***IBM has a major commitment to "openness" (standards) — leveraging and contributing to the open communities, engaging with an ecosystem of partners to bring products to market more quickly;***
- ***IBM is known for architecting innovative, leadership technologies, developed in a collaborative fashion with its clients;***
- ***IBM professional services specialize in industry-specific, specialized business process flow analysis, design, and management.***
- ***IBM builds and integrates its own service oriented architecture and SOA application development products.***
- ***IBM is a marketplace leader in service management practice and software. And finally,***
- ***IBM offers several different hardware platform choices to address a variety of scale-up and scale-out computing needs. IBM can offer all of these products and services as part of an integrated offering under a single volume purchase agreement.***

Competitive Dynamics

Consider Sun, Hewlett-Packard, Dell and Cisco as possible competitors of IBM in the enterprise data center space. Then examine each closely:

- Sun may be IBM's closest rival when it comes to building new data centers. Sun's strategic "utility computing" direction is similar to IBM's vision of the new enterprise data center. Further, Sun provides its own virtualization and provisioning software for its Solaris environments. And Sun has services available for the tuning and optimization of its own hardware.

  On the downside, Sun is 1/10 the size of IBM; has a comparatively miniscule professional services organization (lacking the breadth and depth of IBM's professional services); and must rely on third party professional services providers for business process flow expertise.

- Dell, like Sun, has a comparatively miniscule professional services organization and must rely on third party professional services expertise for business process flow expertise. Unlike Sun, Dell does not make its own virtualization and provisioning products — nor does it make SOA middleware. Dell can help IT managers tune and optimize x86-based servers (Dell is excellent at this) — but has no significant scale-up system offerings that can compete with large, highly-scalable, consolidate high-end systems.

- Hewlett-Packard's (HP) professional services organization can engage in business process flow consulting — but HP tends to partner with third party professional services firms (EDS, Accenture, et al) in these types of consulting engagements. Hewlett-Packard exited the infrastructure middleware business years ago, and now partners with third parties such as BEA and Oracle for SOA software (this means that HP is highly reliant on other vendors to implement the middleware and infrastructure products needed for the "shared" phase in the implementation of service oriented data centers). HP can help its clients consolidate, virtualize, and provision their IT environments — but its scalability options are limited as compared to IBM. HP's scale-up choices include the adoption of Itanium-based architectures (*Clabby Analytics* is already on record as an "Itanium non-enthusiast") — or adopt a clustered x86-based approach. Meanwhile, IBM can offer System z, System i, System p, and/or System x scale-up alternatives — as well as sophisticated blade and rack architectures — each system offering best-in-class scalability and virtualization capabilities.

- Cisco is known for its network and network management products — and has been making moves into the virtualization arena as of late (hosting the logic for virtualization at the network switch level — and then managing it from that point). From *Clabby Analytics* perspective, the logic needed to perform resource virtualization does not belong out on the net — but rather at the system/storage device level. EMC has tried this place-the-virtualization-logic-at-the-switch approach with its InVista product — and has not found much success with it. I suspect that Cisco will meet with the same limited success as it tries to host virtualization logic on the network. Also, Cisco does not provide business process flow consulting and management — nor process orchestration — both of which are required in advanced service oriented data center implementations.

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Summary Observations

Out-of-control operational costs related to information systems labor costs, security, compliance, and power/cooling are inhibiting the ability of IT executives to launch new business initiatives. Funding that could be spent on business innovation is instead being spent on maintaining information systems status quo.

To correct this situation, action needs to be taken to make data centers more efficient — and to prepare them for the next generation of Internet-based, service oriented applications and workflows. Specifically, enterprises need to optimize the use of their computing resources by consolidating and virtualizing systems, storage, and network systems. Enterprises need to adopt standards-based, service oriented architecture in order to improve application interoperability and simplify data sharing. This dynamic approach also paves the way for next generation Web 2.0 applications, mash-ups, and, ultimately, for automated business process flows.

IBM's on demand vision (announced in late 2002) set in motion this migration from tightly-coupled, inefficient data centers of the past to the loosely-coupled, flexible and dynamic architectures of the future. And in the years that have ensued, IBM has worked with thousands of customers to help articulate and refine that vision. Based upon real-world data center transformations, IBM has identified three phases of new enterprise data center implementation — and has well defined patterns and architectures for building them.

IBM's closest competitors in this space — HP, Dell, Sun, and Cisco — all have technologies that can be used to help architect service oriented data centers. But each of these companies has services and product shortcomings as compared with IBM. IBM is the only vendor that can single source a completely integrated systems/stor-age/infrastructure/database/applications environment with its own technologies. And, as one of the world's largest professional services providers, IBM's key competitors do not rival IBM in terms of the breadth and depth of services offered.

While IBM can provide most or all of what an enterprise needs to build a new enterprise data center, it should be noted that IBM is also a staunch supporter of open standards and has an extensive ecosystem of technology and services partners. For instance, if an enterprise wants to focus on reducing energy consumption in the data center, IBM has numerous partners who can help work on power management, heat dissipation, and other energy-related challenges.

In the end, it is not just data center technology that we're talking about. The new enterprise data center model is broadly about using technologies more efficiently to streamline business process flow in order to make people more efficient and effective. Helping enterprises shift from a pure operations-focused orientation to a more strategic, responsive, service delivery orientation is ultimately what transforming your data center is all about.

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