

Marketplace Update

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IBM System x iDataPlex – Enabling Web 2.0 with Internet-Scale Solutions

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Introduction

The enterprise information technology (IT) landscape is populated with opportunities and challenges. For decades, server and storage solutions have been the engines powering a multitude of business efficiencies and company profits. More importantly, as these solutions continue to evolve, they offer organizations an ever-growing number of technological means to achieve new ends. But even as enterprise technologies improve within, they face significant challenges from without.

Chief among these are the cost and availability of the electrical energy needed to power, cool and manage increasingly outmoded datacenters. As the price of electricity continues to climb and power grids strain to supply growing demands, many companies are struggling to support aging, energy-hungry IT infrastructures. In turn, this makes it difficult or even impossible for them to consider how to increase computing density to embrace valuable new business processes. As a result, there is a clear need for a new generation of solutions that reduce both server and power consumption.

In addition, those problems are likely to rise as organizations adopt technologies designed to support new Web 2.0 applications. Rather than the scale-up UNIX and mainframe systems that have been common in enterprise datacenters for decades, these new processes leverage massive, high-density "Internet scale" IT infrastructures comprised of thousands or tens of thousands of clustered commodity x86-based server nodes. To coin a phrase, these are not your Daddy's, let alone your Granddaddy's, datacenters. As such, they have inspired vendors including IBM to fundamentally reconsider datacenter problems and solutions.

Effectively addressing these challenges is the goal of the IBM System x iDataPlex, a new category of servers. The iDataPlex solution offers enterprises a unique approach to and different value proposition for taking advantage of emerging market opportunities' including Web 2.0, but it is built on decades of IBM innovation. In the iDataPlex design, IBM leverages a variety of existing rack and BladeCenter technologies – along with offerings from key partners – but also fundamentally re-imagined how they might be assembled, manufactured and deployed. The result is a highly familiar yet essentially new Internet-scale datacenter solution that is powerful and flexible enough to address a host of next generation business challenges.

Datacenters – Challenges Within and Without

Compared with other industrial construction, datacenters can be exotic locales that combine a mix of traditional facilities design with demanding technology, power and cooling requirements. Traditional datacenters have served IT customers and consumers pretty well for over four decades, but three issues are pressuring owners:

1. **Shifting cost dynamics** – Businesses are used to expanding or extending datacenters on a regular or even constant basis. But ever-growing facilities' ever-increasing power re-

quirements are difficult to support in a time when energy costs are spiraling upward. In addition, power grids in many regions are under strain, limiting the ability of companies to fully deploy the IT solutions they need or to take full advantage of existing facilities.

2. Expanding computing demand – Datacenters are huge consumers of electrical power, making them an understandable target for energy efficiency initiatives. But this creates a dichotomy for many organizations: Despite the growing interest in and efforts toward decreasing datacenter power consumption, next generation IT solutions that offer businesses significant benefits expand compute density by as much as 10X. Similarly increasing power consumption is unsustainable for the vast majority of companies.

3. Datacenter lifecycle complications – Toss into this already complex mix yet another complication: according to some research, over 4/5th of U.S. datacenters were built prior to 2001, making it hard for them to meet evolving 21st century IT and energy requirements. As a result, organizations are becoming increasingly painfully aware of how facilities inefficiencies impact the overall total cost of ownership (TCO) of their datacenters.

In essence, the most critical challenge today for IT vendors is how they can help customers achieve better IT infrastructure performance and better energy efficiency.

The Web 2.0 Datacenter Value Proposition

That challenge is particularly severe in the case of organizations considering or adopting emerging Web 2.0 businesses applications. Though some may consider Web 2.0 to be an amorphous bucket that is as wide as it is deep, in this report, we see Web 2.0 as covering a range of Internet- and network-intensive solutions including:

- Content aggregation, search, mobile commerce, Webmail, online storage, and media management applications and services such as those offered by Google and Yahoo
- Commerce enabling Web sites and services like those provided by Amazon and eBay
- Broadcast and entertainment offerings including online gaming and virtual world environments, and media technologies such as video streaming and rendering farms
- Social networking sites like Facebook and MySpace, plus consumer and business collaboration solutions including blogs, wikis and mash-ups
- Hosted applications and Software as a Service (SaaS) offerings like those delivered by Salesforce.com

Even as Web 2.0 applications and services reflect emerging consumer and customer behaviors, their support often requires technologies that are significantly different than traditional enterprise IT infrastructures. Many Web 2.0 datacenters leverage massive scale-out deployments (1000s to 10,000s) of networked x86 servers instead of traditional scale-up UNIX and mainframe systems.

In addition, rather than pursuing conventional hardware-centric system resiliency, the primary goal in Web 2.0 environments is to pursue software resiliency for service provision and delivery. This is enabled, in part, by decoupling applications and workloads from specific servers and ensuring their availability and reliability with massive pools of scale-out server resources.

These infrastructures also leverage associated solutions including parallel programming, virtualization, clustering, grid and “cloud computing” technologies. Powerful and flexible networking and datacenter resources also play critical roles in supporting the software re-

siliency needed to rapidly and reliably deliver Web 2.0 applications and services. In addition, support for Open Source is critical in these environments, since the vast majority of Web 2.0 solutions are Linux-based.

Not surprisingly, Web 2.0-specific datacenters tend to be purpose-built, and many are located in rural or remote areas that enjoy ample and readily available electrical power. Many owners take a ground-up approach in designing these structures, closely scrutinizing every granular aspect of construction from the lowliest server power supply to facilities-wide water and cooling systems.

Why Datacenter 1.0 Can't Support Web 2.0

Traditional datacenters face numerous difficulties in supporting Web 2.0 deployments, but simplest is scale. Massive scale-out infrastructures portend massive challenges for their owners. The cost and complexity of acquiring and deploying typical enterprise-class servers for these environments can be enormous. Instead, Web 2.0 requires strategies with which many traditional datacenter owners are unfamiliar.

Existing datacenters can be used for Web 2.0 deployments, but many would require extensive remodeling and retrofitting. More important, the challenges do not end when construction is finished. These new solutions can severely impact existing power and cooling infrastructures, resulting in additional wear on older components. This can add substantially to maintenance costs and even affect system reliability. Web 2.0 infrastructures can also require unfamiliar management skills and strategies, meaning that IT staff may need specialized education or retraining.

The impact of Web 2.0 is not entirely internal but instead extends well beyond the walls of the datacenter or even the larger organization. Limitations in local or regional power infrastructures can influence deployment options or restrict the location of Web 2.0 facilities. This is common in highly populated urban areas, but may also be a concern in areas where climate change is expected to limit the availability of hydroelectric and other power sources.

Additional challenges lurk in granular server and component designs. Some commercial Web 2.0 solutions leverage existing scale-out server products, simply stripping out redundant power supplies and fans. While they do consume less power, most of these systems offer server density similar or identical to conventional racks. Just as important, despite their lower power draw the conventional footprint of these solutions can still require owners to rethink, retrofit or replace their datacenters.

Given the technical needs of Web 2.0 and the shortcomings of some offerings, it should come as no surprise that many datacenter owners eschew commercial IT solutions and design their own server solutions, outsourcing fabrication to third party manufacturers. With this in mind, we believe that to broaden the adoption and success of Web 2.0, vendors need to develop and deliver entirely new categories of commercial datacenter systems.

IBM System x iDataPlex – An Internet-Scale Solution to Web 2.0

This is precisely the approach IBM took in its new iDataPlex design. The company realized that not every enterprise would either want or need Internet-scale solutions. IBM's System x rack and BladeCenter solutions can provide scale-out computing capabilities that many or

most customers need. But since those systems are not fully appropriate for support Web 2.0 applications and services, IBM decided that a new class of System x solutions was needed.

Before moving ahead the company held extensive consultations with IBM customers and other organizations that are already designing and utilizing Internet-scale datacenters. With those insights in hand, the company leveraged some of the best features of its System x rack and BladeCenter solutions to develop a unique design that can pack more than twice the server density into the footprint and height of a standard 42U rack.

Organizations can achieve up to 240% the server density and up to 5 times the compute density with iDataPlex that they would with standard 42U rack servers. Additionally, IBM delivers that performance in a remarkably thrifty power envelope. The iDataPlex's chassis design reduces the amount of air typically needed for cooling by half, and also leverages new power supply and fan technologies that increase energy efficiency by up to 40% over conventional rack systems. As a result, IBM estimates that these features can deliver cooling savings of approximately \$1.2 million in a typical (10,000 server) Internet-scale datacenter.

However, cooling saving do not stop there. IBM's optional liquid cooled Rear Door Heat Exchanger can actually eliminate heat exhaust from iDataPlex racks, significantly lowering energy consumption and power expenditures even further. This makes it among the "greenest" scale-out IT solutions currently available. Though liquid cooling was once common in datacenters some people scoff at the notion today. However, the parallel needs of reducing power consumption while increasing datacenter performance may be the "perfect storm" that triggers its return. To that point, IBM discovered that over half of the enterprises it spoke with that are planning Web 2.0 datacenter construction are also incorporating liquid cooling capabilities in their designs.

iDataPlex innovation continues with robust fabric offerings from industry leader switch suppliers including Blade Networking Technologies (BNT), Cisco, Force/10 and SMC. In addition, some members of the Blade.org community (who support IBM's BladeCenter architecture) also plan to develop iDataPlex solutions. This multitude of server and infrastructure options offers customers remarkable flexibility in configuring individual iDataPlex racks and entire infrastructures to support a range of applications and services including those requiring compute density and those that need optimized I/O.

Finally, IBM has incorporated notable features for easing iDataPlex fabrication, deployment and management. The company redesigned over 20 manufacturing processes for iDataPlex and each system is built to customer specifications. Systems are pre-integrated and tested at the factory, and shipped in fully assembled racks that are ready for immediate installation, a strategy that hugely reduces shipping materials, and significantly lowers deployment time and effort. Because iDataPlex is designed to fit in a common rack footprint, systems can be deployed without changing or reorienting existing datacenters. After installation, front panel access to all components reduces service and management complexity. In short, by efficiently managing complexity at the front (factory) end, IBM has effectively reduced complexity for customers at the back (datacenter) end.

Bottom line: Adopting IBM's new iDataPlex allows owners of typical Internet scale datacenters to enjoy increased compute performance, lower power and cooling expenses, and simplified system installation, maintenance and management, significantly lowering their overall datacenter TCO.

IBM's iDataPlex Value Proposition

iDataPlex incorporates numerous technological and business innovations, but all were designed by IBM to help the new systems achieve specific goals:

- **Affordable and green** – Leveraging the iDataPlex design, IBM aims to provide customers the lowest capital acquisition costs, lowest operational expenses, and lowest TCO of any commercial Internet-scale datacenter solution. By minimizing power requirements and maximizing compute performance, iDataPlex qualifies as one of the most energy-efficient, “green” IT solutions available.
- **Efficient and open** – The iDataPlex solution achieves these qualities through an innovative design that utilizes industry standard components in entirely new ways. IBM worked closely with leading switch suppliers to provide iDataPlex customers robust fabric and network options. In addition, the company's long-standing support of Linux, Open Source and open standards makes IBM an ideal source for Linux-minded Web 2.0 clients.
- **Scalable** – iDataPlex technology is designed for easy, efficient scalability to tens of thousands of nodes. Systems are custom built according to customer specifications, pre-integrated, and rigorously tested at the factory. They are then shipped fully assembled and ready for immediate deployment in new or existing datacenters.
- **Available** – The iDataPlex system has been designed for Web 2.0-style software resiliency from the bottom up. In addition, iDataPlex incorporates a host of features designed to lower service requirements, simplify system management, and ease maintenance processes.
- **Flexible** – iDataPlex server, storage and fabric components can be configured to support numerous applications and services including those that require compute density and those that demand optimized I/O. Since systems are built to customer specifications, they can be easily customized in the factory to meet organizations' unique technical and business requirements.

Summary Conclusions

For decades, server and storage solutions have been the engines powering a multitude of efficiencies and company profits, but even as enterprise technologies improve within they face significant challenges from without. These problems are increasing as organizations adopt the massive, high-density scale-out IT infrastructures technologies required for new Web 2.0 solutions including content aggregation, broadcasting and entertainment, commerce enablement, social networking and virtual world environments, and hosted application offerings including SaaS.

While many Web 2.0 infrastructure solutions utilize existing or slightly altered scale-out computing products, we believe that to achieve broad commercial adoption and success, vendors will need to develop and deliver unique categories of Internet scale datacenter solutions. IBM's System x iDataPlex, which was designed after extensive consultation with existing Internet scale datacenter owners, offers enterprises a new approach to and different value proposition for pursuing Web 2.0 capabilities and market opportunities.

In iDataPlex, IBM blends a host of existing System x and BladeCenter technologies with new innovations that allow enterprises to achieve up to 240% the server density and 5 times the compute density that they would with conventional racks. In addition, the iDataPlex solution is easier to manage and also costs 40% less to cool than conventional 42U rack server solutions but stays within that same datacenter footprint. Notably, optional Rear Door Heat Exchanger for iDataPlex can actually eliminate heat exhaust and significantly reduce facilities' energy requirements. According to IBM, the iDataPlex design can provide owners of typical Internet-scale datacenters up to \$1.2 million in annual cooling savings.

Component options including fabric and networking products from IBM partners allow iDataPlex to be flexibly configured to meet specific Web 2.0 application and service requirements. In addition, since iDataPlex systems are custom built, they can be easily customized in the factory to meet customers' specific business and technical requirements. iDataPlex racks are preconfigured and tested in the factory, and shipped fully assembled so they can be immediately deployed in new or existing datacenters. iDataPlex systems can be installed without changing or reorienting existing datacenters, and features including front panel access to all components help streamline service and management processes.

In short, by efficiently managing complexity at the factory, IBM has effectively reduced complexity for customers in the datacenter. The iDataPlex design stands as an essentially new and innovative Internet-scale solution, but it is also a highly complementary addition to IBM's existing System x rack and BladeCenter offerings. Overall, we believe that enterprises considering or planning the deployment of Web 2.0 applications would be well advised to investigate IBM's new System x iDataPlex solutions

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