



## The zEnterprise Hybrid Model — Where Goest Thou?

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### Editor's Note

*This bulletin originally was published with the same title on August 6, about three weeks ago. It has been updated to include new information about IBM's next generation mainframe, which was announced today.<sup>1</sup> That announcement did not affect in any significant way what was written in our original report on IBM's zEnterprise hybrid offerings.*

### Management Summary

A typical automotive buying experience usually includes lots of Internet searching, reading test drive reports, and figuring out how you are going to pay for it. The whole purchasing scenario has been worked out in your mind, you have settled in on the model and features you want and about how much it should cost then, the most dreaded part, walking into the showroom and being greeted by a salesperson. The salesperson engages you with a pleasant greeting and some light chit-chat, paying compliments as to your astute choice, and then as you begin to settle in, he (or she) directs your attention to the Whizbang XLS with the very shiny wheels, and the hottest technology package. He adds that for about the same monthly payment it can be yours, and he just happens to have one of every color ready for delivery. (I smell a sales contest here.) We are talking about choices here. Are they valid alternatives? How do I assess the value of each of these vehicles? One is a little larger, the other is a little faster; one gets a little better mileage, the other has the features that I really want. Has IBM recently presented zEnterprise clients with some new choices? This is the question I intend to answer in the paper.

Since July 2010, when IBM announced its new, very innovative hybrid computing model, Clipper has been tracking its progress in the market place. We expected this to be a very modest (i.e., slow) ramp up, but there is increasing evidence that the acceptance trends have been very positive, to be described subsequently. Not content with this, and much to our surprise at The Clipper Group and perhaps also to most of the mainframe universe because of its timing, IBM announced today its latest and biggest member of the zEnterprise hybrid system technology family, the zEnterprise EC12 (zEC12), a new model of the zBX (the Model 003), and a number of new features and enhancements. These will be discussed later in this paper, but for all of the details, see the report cited in footnote #1 below.

IBM has not been quiet on its other server fronts with its server business model being essentially "one size (and architecture) does NOT fit all". IBM is the only system vendor that gives you so many choices – all competitive in their particular market segment. It's commonly quoted slogan has been: "Fit for Purpose". Most recently, for example, a second hybrid technology set was announced

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<sup>1</sup> An overview and discussion of the new mainframe's announcement can be found in [The Clipper Group Navigator](http://www.clipper.com/research/TCG2012019.pdf) entitled *IBM zEnterprise EC12 – Bigger, Better, Faster* dated August 28, 2012 and, located at <http://www.clipper.com/research/TCG2012019.pdf>. Some of this new information also appears in this report.

on April 11, 2012, IBM *PureSystems*, which IBM calls as an “expert integrated system”.

In its simplest terms, the *PureSystems* family has two systems members, *PureFlex* and *PureApplication*. For the purposes of this paper, I will only be focusing on the first. *PureFlex* is an infrastructure offering consisting of a fully integrated set of *System x* (x86 architecture) and/or *Power System* server computing nodes, in a rack structure, combined with integrated storage and networking, and including all of the required virtualization, and management software for the servers, storage, and networking.

The configurations are fully integrated and factory tested and packaged to be deployable at a client location in hours, not days; and “cloud-ready”, of course. What does this all have to do with *zEnterprise* and its hybrid off-shoots? My goal is to review what’s been going on inside and outside the mainframe’s domain and, hopefully, demonstrate how this all relates to *zEnterprise* hybridization, and the direction it seems to be going. Maybe you will agree, but if not at least I will have directed your attention to trends that bear close scrutiny in the months and years ahead. Accept the challenge, consider my arguments, and please read on.

### The Market Acceptance of *zBX* and the *zEnterprise* Hybrid Computing Model

The new extensions to hybridization of *zEnterprise* (incorporating select IBM *System x* and *Power Systems* blades) are being embraced by enterprise customers, at a rate exceeding that for Linux on System *z* at the same point since its release, but perhaps at a slower pace than IBM mainframe marketers had hoped for and may have predicted. I offer what I believe to be the two most important contributing factors.

1. This was a radical departure from the course which IBM’s mainframe clients have become accustomed; it would take some time to understand, evaluate, and fit it into their computing environments; and
2. It lacked a most important element when first announced—the delivery of support for the most ubiquitous of the distributed server platforms, *Windows* on x86 servers.<sup>2</sup>

<sup>2</sup> More detail related to these points and an overview of the announcement can be found in [The Clipper Group Navigator](#) entitled *IBM’s zEnterprise Really Stretches*

Now, two years later, these barriers have been removed and the hybrid model is now in its early growth stage. IBM claims over 150 *zEnterprise BladeCenter Extension (zBX) Model 002* units sold populated by more than 1100 blades integrated with both *zEnterprise 196 (z196)* and *zEnterprise 114 (z114)* Central Processing Units.

### *zBX* Support Enhancements Pointing to the Future

Several significant enhancements to the *zEnterprise* System have been announced over the last two years and many are already available as of this publication. Most notably are those applying to *System x* blades. First, the maximum number of *HX5* blades supported by *zBX* has been doubled to 56. However, this does not affect the total number of blades supported by a fully-configured *zBX*, i.e., 112, nor does it affect the maximums for other blade types. *HX5* memory configurations have been increased to include 192 and 256 GB capacities, in addition to the already-available 64 and 128 GB configurations.

Several enhancements and additional features have been made to increase the depth and scope of the *zEnterprise Unified Resource Manager* performance monitoring and the collection of metrics from the hypervisors and network resources associated with *zBX*’s *POWER7* and *System x* blades. This further enables the control and management of performance, general health, and assists with problem determination. The metrics are accessible through APIs and are displayed on the Monitor Dashboard. Load balancing decisions are now facilitated for tools that implement *Server Application State Protocol (SASP)*. The *Hardware Management Console (HMC)* now supports the dynamic discovery of storage resources, in addition to server and networking resources discovery delivered initially.

Interconnectivity has been improved dramatically through the integration of *HiperSockets*<sup>3</sup> with the 10 GbE *IntraEnsemble Data Network (IEDN)*. This effectively extends the *HiperSockets* network outside the *zEC12*, *z196*,

*Its Boundaries – New Windows Are Opened*, dated October 12, 2011, and located at <http://www.clipper.com/research/TCG2011034.pdf>.

<sup>3</sup> *HiperSockets* is a technology that provides high-speed Transmission Control Protocol/Internet Protocol (TCP/IP) connectivity between servers within a System *z*. This technology eliminates the requirement for any physical cabling or external networking connection among these *virtual* servers. It operates at memory transfer speeds.

or z114 central processors to the entire system *node*<sup>4</sup>. Related to this is the addition of the HiperSockets Completion Queue, which enables both synchronous and asynchronous data transfers. This combines the objectives of ultra-low latency with improved tolerance for traffic peaks. These features also are planned to be supported, at an unspecified date, in the *z/VM* and *z/VSE* environments.

In the area of multi-tier application support, where the database tier is *DB2 for z/OS*, the *zBX* now supports the SAP application environment for *Linux* and Windows running on select System x blades and *AIX* on select POWER7 blades – when they act as application or presentation layer servers.

### **The Strategy Continues with zEC12**

Today, with the announcement of the *zEnterprise EC12 (zEC12)* and the *zBX Model 003*, there is another round of improvements to support the greatly expanded capacity of the new system. It is accurate to state that the *zEC12* announcement is weighted more heavily toward the new *zEC12* processor, but there are new enhancements to the *zBX* frames and the Unified Resource Manager, as well.

First, a new model of the *zBX*, Model 003, has been introduced to support the *zEC12*. With the new Model 003, the bandwidth of the switch connection from the BladeCenter chassis, located within the *zBX* frame, with the Top-of-Rack (TOR) switch has been doubled to 20 GbE. This enhancement will provide improved bandwidth to those with larger POWER7 or System x blade counts. No changes have been made to the *Intranode Management Network (INMN)* or the *Intraensemble Data Network (IEDN)*. Also, no changes have been made to the *zBX* blade options or configurations. There is no charge for upgrades of the *zBX* Model 002 (introduced with the z196 in July of 2010) to the Model 003 or for transferring existing blades to the *zEC12* for management by *zManager*, including the *zManager* entitlements. Second, in the management firmware and software arena, new *IBM System Director* capabilities are planned to be added through the *zManager*'s APIs. They include the ability to support virtual server provisioning and image management, energy management functions, and power capping of blades.

Third, IBM has announced its intent to de-

liver workload-aware optimization for System x blades through functional enhancements to *zManager*. This allows virtual CPU capacity to be adjusted automatically across virtual servers within a hypervisor, helping to insure that System x resources in the *zBX* are executing to the defined SLAs. This capability currently is provided for Power System blades, in support of the z196/*zBX* Model 002.

The progress that IBM has made to date with its *zEnterprise* hybrid technologies demonstrates its commitment to this hybrid product strategy; moreover, it is indicative of their response to the needs of its clients.

### **Customers Tell the Story of zBX Success**

Below are three examples of *zBX* blade servers being attached to the mainframe that incorporate *HX5 (x86)*, *PS701 (POWER7)*, *IBM DataPower XI50z*, or *IBM DB2 Analytics Accelerator* platforms.<sup>5</sup>

#### **BG-Phoenics**

BG-Phoenics GmbH provides a comprehensive set of IT infrastructure and software services to social security institutions and professional associations in the Federal Republic of Germany. They serve 5,800 client organizations in 130 locations through two data centers and, as such, they have statutory obligations to their members to ensure efficient, effective, and secure information processing with a low TCO. Their strategic vision is to provide the best features of the three architectures they were using: the security, robustness, and scalability of the mainframe, the processing power and the broad application portfolio available for UNIX, and the low costs and scale-out capability of x86 systems. They were challenged by the number and scale of the multi-tier applications being seen, with a corresponding increase in complexity and management costs for its existing infrastructure. In particular, the IT-related personnel and other operational costs (including power and cooling hardware) were rising steeply.

BG-Phoenics choose a solution based on *zEnterprise 196* servers, *zBX* frames housing *PS701 (POWER7)*, *BladeCenter HX5 (x86)* blade servers, and the centralized management control system provided by the *zEnterprise Unified Resource Manager*. The z196 is the

<sup>4</sup> A node is a collection that includes a z196 or z114 and one to four *zBX* units.

<sup>5</sup> The *IBM DB2 Analytics Accelerator for z/OS V2.1*, incorporating *IBM Netezza* technologies was announced on October 12, 2011, and replaced the *IBM Smart Analytics Optimizer V1.0* as the relational query accelerator appliance; however, it is *not* installed within the *zBX* frame.

base for mission-critical applications including several large DB2 databases serving multiple SAP ERP solutions to ensure the highest quality of service objectives. Linux for System z hosts their Lotus Domino environment for email and collaborative applications plus connecting to Domino applications running on the POWER7 blades. Other key applications running on these blades includes tools for monitoring resource utilization for software running across their Power Systems landscape that includes standalone IBM Power Systems 770 and 595 servers. The POWER7 blades also host *Tivoli Enterprise Monitoring* that plays a key role in assuring quality of service by managing its complete infrastructure including its distributed servers. The HX5 blades will be used to host a number of different Linux-based systems including content management, IBM *WebSphere Application Server*, and additional Tivoli monitoring applications.

With three different architectures in a single interconnected physical environment, managed through a single set of integrated management tools, the IBM zEnterprise hybrid solution meets BG-Phoenix's strategic requirement for flexibility combined with simplicity. Its executives state that the same method for implementing new servers across AIX, Linux and Microsoft Windows brings a host of benefits, all translating to reduced long-term cost of ownership:

- Faster and more transparent processes;
- Reduced administration and lower training costs;
- Improved quality;
- Easier automation; and
- Greater consistency.

#### Eurocontrol

Eurocontrol is the Netherlands-based organization responsible for all European air traffic control. Its challenges are to provide a safe flying environment, efficient operations, reliable performance, and flexible capacity to meet the needs of a Single European Sky. Not your typical data center set of applications, the IT infrastructure is designed to collect and distribute, in real-time, data streaming in from every aircraft within its purview. There is virtually no tolerable margin of error or interruption permitted in their operations.

In its prior environment, the various applications operated independently on separate and diverse platforms, based upon the one-server-one-application model. Continuing with this

strategy was not sustainable technically or financially. Eurocontrol needed to be assured that these applications would run in a consolidated virtual environment. The organization conducted an in-depth study, focusing on reliability, functionality, flexibility, migration, management, and total cost of ownership (TCO). The conclusion was that a solution based on completely virtualized environment including IBM System z and Intel x86 servers best met its needs. It was at this time in 2010 that IBM announced the new zEnterprise with the zBladeCenter Extension.

Eurocontrol determined that this environment would be extremely well suited to operate Linux on System z, as well as Linux on Intel (IBM HX5) blades. It was a perfect match for Eurocontrol's goals providing it with a solution that consolidates system management functions onto a single console, based upon a management product that implements Infrastructure-as-a-Service (IaaS). Thus, it satisfies the ultimate objective to establish a single private cloud in which all applications can run with a guaranteed service level for computing capacity and availability for lowest TCO. The implementation of this smart datacenter is now in full swing and is to complete in 2012.

#### ZZZS

ZZZS is the Slovenian acronym for the Health Insurance Institute of Slovenia, the public agency that provides the compulsory health care insurance for that nation. As such the Institute manages enormous amounts of data, not only those representing the millions of insured residents but also those generated by healthcare service providers, pharmacies, and private insurers. Following a complex development project converting from the use of electronically-encoded health insurance cards to an online application giving healthcare providers instant access to individual patient's health insurance status and allowing claims to be processed electronically, it began to experience an exponential increase in resource requirements. A second key driver was the desire to accommodate web-based inquiries and data analytics applications better, both also important to the delivery of reliable, secure, high-volume services to several classes of users.

The zEnterprise 196 was the key to the solution of their performance concerns, after having considered an update to their existing *IBM z10 EC*. Not only that but the zEnterprise BladeCenter Extension provided them an ideal plat-

form to centralize management control by replacing standalone IBM DataPower appliances with IBM DataPower XI50z appliances under the covers of the zBX. These appliances are responsible for the security and XML-parsing for its web-based applications.

The z196 is enabled with all of zEnterprise systems specialty processors – *ICF*, *IFL*, *zIIP*, and *zAAP*<sup>6</sup> – all of which received substantial performance benefits from the upgrade. In addition, with Parallel Sysplex and DB2 for z/OS Data Sharing, *ZZZS* is processing 1.7 million transactions per day on a 24x7 schedule.

### ***Five zEnterprise Hybrid Computing Profiles***

From these examples and many others clients who are currently using or evaluating zEnterprise hybrid computing typically fall into one or more of these topologies.

1. Multi-tier business applications where the database tier is DB2 for z/OS and the application servers are on distributed UNIX, and the presentation tier is on x86 servers.
2. Multi-tier business applications where the database runs on Linux for System z (on IFL processors) and the application servers are on distributed platforms, either UNIX- or x86-based.
3. zEnterprise clients with a sprawl of non-IBM UNIX and Windows servers who desire more powerful centralized control of their applications.
4. A DB2 for z/OS data warehouse and data marts on distributed servers who need to accelerate query performance.
5. Extending legacy mainframe applications through web services or implementing a Service-Oriented Architecture.

It should be noted that references above to UNIX, when not specified as IBM's *AIX*, will imply porting to *AIX*, which is the only version of UNIX supported on Power System blades in a zBX. Clearly, what is common to these profiles is the close affinity of the data embodied in the application(s) running on the distributed servers to its ultimate host, the mainframe. This is likely to be the computing model of most modern

<sup>6</sup> *ICF* – *Integrated Communications Facility* (for connecting mainframe systems); *IFL* – *Integrated Facility for Linux*; *zIIP* – *z Integrated Information Processor* (for database acceleration); *zAAP* – *z Application Assist Processor* (for Java offload)

data centers, multi-tiered, than the old mainframe (legacy) model, all programs and data in a central host.

### **Hybridization Moves “Down Market”**

It seems to this writer, and perhaps other close watchers of IBM, that there was some degree of inevitability to the extension of hybrid technologies<sup>7</sup> beyond the System z family. After all, IBM had already demonstrated mastery in connectivity of multiple architectures and centralization of control. It wasn't clear how this would be done, but at the time of the announcement it was revealed that this goal had been a focus of IBM's system developers for some period of time, almost three years.

Start with a zBX cabinet. It contains System x blades and Power System blades and a substantial interconnection network. Unhook it from the zEnterprise EC12, 196, or 114, replace that with a powerful self-contained system management server with comprehensive and robust functionality, throw in a storage server with substantial capacity, connect these elements together with a 10 GbE LAN, and you are most of the way to the recently announced IBM *PureSystems* integrated solution called *PureFlex*.<sup>8</sup> There are numerous aspects of this compelling new technology which are not within the scope of this paper, which is to focus on different vehicles for delivering slices (virtual machines) of outboard (to the mainframe) server infrastructure to applications and users. Several of the shared characteristics of the zBX and the *PureFlex* infrastructure were identified above:

- The compute node,
- Mixed architecture (chip) technologies,
- The interconnection network,
- The central management controls, and
- The very similar enclosures.

However, the devil is in the details and how each of these elements is implemented are in most cases dramatically different.

Referring to Exhibit 1 on the next page, although the physical dimensions of the two maximum configurations are similar, if not

<sup>7</sup> For the purposes of this paper, I am defining hybrid technology as multiple architecture computing elements, within a common footprint, tightly networked with all necessary management control from a central point.

<sup>8</sup> IBM emphasizes that the announcement of *PureFlex* does not abrogate its continued development and support of existing System x and Power Systems BladeCenter products.

**Exhibit 1 — Comparing zBX to Networked PureFlex**

System Element	zBX Model 003 (Max. Configuration)	PureFlex (Max. Configuration)
Rack / Chassis	42U x 4	42U x 4
Compute Elements Form Factor	Blade	Node - Half-wide/Full-wide
POWER Technology	PS701: 1 x 8 core P7 @ 3.0 GHz, 32 MB L3 cache	p460: 4 x 8 core P7 @3.55 GHz, 32 MB L3 cache (FW) (see Note 3 below)
x86 Technology	HX5: 2 x 8 core E7-2830 Intel Xeon @2.13 GHz, 24 MB L3 cache (see Note 2 below)	x240: 2 x 8 core E5-2690 Intel Xeon @2.9GHz, 20 MB L3 cache (HW) (see Note 4)
Memory - POWER	PS701: 128 GB/blade	p460: 512 GB/node
Memory - x86	HX5: 256 GB/blade	x240: 768 GB/node
Storage on blade/node - POWER	PS701: 300 GB/blade	p460: HDD - 1.8 TB or SDD - 354 GB
Storage on blade/node - x86	HX5: 2 x 50 GB SSD	x240: HDD - 2TB or eXFlash - 1.6 TB
POWER compute capacity (nodes; cores) (see Note 1, below)	112 blades, 896 cores (112 blades x 1 proc. x 8 cores); 224 cores/chassis	112 nodes, 3584 cores (112 nodes x 4 proc. x 8 cores) 896 cores/chassis.
x86 compute capacity (nodes; cores) (see Note 1)	56 blades, 896 cores (56 blades x 2 proc. x 8 cores); 224 cores/chassis	224 nodes, 3584 cores (224 nodes x 2 proc. x 8 cores); 896 cores/chassis.
External Storage	Via SAN and NAS	Storwize V7000 server in chassis plus SAN or NAS
Internal Network	Private to zEnterprise - 10 GbE Data Network, within the zBX – 20 GbE, plus 1 GbE Mgmt Network	Flex System Fabric EN4093 10 GB Scalable Switch
Management Control Point	System z HMC, Unified Resource Manager (zManager)	Flex System Manager Node
Supported OS/Hypervisors - POWER	AIX / PowerVM	AIX, IBM i, Linux / PowerVM
Supported OS/Hypervisors - x86	Windows, Linux / KVM	Windows, Linux / KVM, VMware, Hyper-V

**Notes**

1 – A 56 blade HX5 configuration reduces the total number of slots available for other blade types to 56; max total = 1344 cores.

2 – *Nehalem-Westmere EX Series*

3 – p260 and p24L [Linux only] (HW) also available

4 – *Sandy Bridge-EP Series*; x220 also available

identical, a cursory examination reveals that the computational capabilities of the 16-chassis PureFlex configuration<sup>9</sup> apparently far exceeds that of the zBX.<sup>10</sup> The PureFlex uses later technology; its x86 node uses *Intel Sandy Bridge* versus the year older *Nehalem* base of the HX5 blade in the zBX. The PureFlex POWER7 node has 4 times the core capacity of the PS701 blade of the zBX and runs at an 18% faster cycle time. The memory available for each computing element is about three times greater in the PureFlex

configuration. Comparing the total core count is no contest. The zBX maximum core count is 896 cores, either x86 or POWER7 (1344 cores if 50/50 blade mix), whereas a maximum PureFlex configuration contains 3,584 cores, either x86 or POWER7, or a combination thereof.

The PureFlex solution also offers a wider choice of operating systems. AIX, IBM i, or Linux with virtualization managed by PowerVM are available, and may be mixed, on the POWER compute nodes. On the x86 compute nodes Windows Server or Linux with virtualization managed by KVM, VMware, or Hyper-V is supported. The zBX is limited to AIX on the POWER blades, virtualization by PowerVM and Windows Server or Linux on the x86 blades with virtualization managed only by KVM.

<sup>9</sup> The current maximum configuration for a PureFlex server solution.

<sup>10</sup> IBM has not provided any benchmark data that compare these configurations or any subset. I will speculate that they do not intend to do so because they are not interchangeable solutions.

Clearly, down-market is not meant to imply lesser computing capacity.<sup>11</sup>

### ***Three Open Questions to Consider***

Time out, you say! This is not a fair comparison (hoping to avoid any possible suggestions of an internal IBM battle). After all, these two examples of IBM's hybrid technologies are clearly designed for different purposes, as I have already suggested on page 4, and will be primarily pitched to different customer sets. Moreover, the zBX is not a stand-alone system but the hybrid extension of a larger solution that includes zEnterprise processors, the zEC12 and z196 at the high end and the mid-market z114, and the comprehensive integrated management and control structure embodied in the zEnterprise Unified Resource Manager. That's fair, but the similarity of these two technologies begs the question: If the zBX, with its POWER7 and x86 blades<sup>12</sup>, then why not the PureFlex, with its POWER7 and x86 computing nodes? One well-deserved criticism of the existing zBX capabilities is its limited scale<sup>13</sup>. This apparent shortcoming is exacerbated by the presence of the PureFlex solution now included in the consideration and evaluation set for clients to agonize over.

IBM has thought about this, as you might expect. However, there are three fundamental questions to consider.

- ***Will the PureFlex infrastructure replace the zBX infrastructure (and with that still maintain the centralized management and control of all virtual images)?*** IBM says no, at least not through the next few generations of zEnterprise servers. In my opinion the zBX, in the form that we know it today, is not in IBM's longer range plans. Certainly, as we would expect from IBM, the evolution

<sup>11</sup> IBM simplifies ordering and distribution of PureFlex by offering three preconfigured "models": *Express*, *Standard*, and *Enterprise* (small, medium, and large, respectively) plus build-to-order (BTO) configurations with any mix of x86 and Power7 nodes, storage, and networking, as required, but still integrated and tested at the factory.

<sup>12</sup> The zBX may also include IBM DataPower XI50z appliances providing higher performance and broad JAVA enablement capabilities. The IBM Smart Analytics Optimizer, Version 2 is no longer available, but has been replaced by the IBM DB2 Analytics Analyzer for z/OS, Version 2.1, effective October 12, 2011, which is not installed within a zBX rack.

<sup>13</sup> Power Systems and System x blades and the supporting infrastructure only use approximately 50% of a 42U rack. Representatives stated that the conservative design point was used to ensure the qualities of service expected by its mainframe clients.

of zBX will incorporate state-of-the-art designs, as reflected in PureSystems, and will likely integrate PureSystems hardware technologies in a future generation.

- ***To what extent can the zBX, within the overall zEnterprise System structure, co-exist with the PureFlex solution?*** IBM's response is to support full connectivity through typical 10 GbE switching, duplexed for higher availability. This provides the flexibility not only accommodate applications and processes that benefit from closer integration with the mainframe, but also provides a means of non-disruptive migration of applications from one blade/node resource to another and protects existing investments in *VMware* or *HyperV* virtualization infrastructure. Federated management of both sets of datacenter resources will be provided by *Tivoli Enterprise Service Management* (or similar ISV management tools), which is complementary to, but does not replace the zEnterprise Unified Resource Manager. This is essentially the same degree of connectivity and integration that can be provided for any other, including non-IBM, distributed collection of servers.
- ***What is IBM's long-range zEnterprise hybrid computing strategy?*** What IBM has shared with us at this time is that they are committed to the zEnterprise Hybrid computing paradigm, notably tight integration and operational controls for all the system's resources, whether under the mainframe's covers or on zBX blades. Clients should expect to see growth in zBX capacity, incorporation of newer x86 and POWER technologies, and improved integration and management controls primarily – but not limited to – enhancements in the Unified Resource Manager. As for tighter integration with PureSystems (instead of or in addition to the current zBX with BladeCenter blades), this likely will occur *over time* but in harmony with the existing zEnterprise management paradigm. The exact nature and timing of this remains an open question.

## **Conclusion**

Current and prospective zBX clients should be assured that this solution is most effective and has the highest potential for value in those installations that fit into one or more of the five computing profiles described earlier (on page 4). **The generalized case can be stated as any distributed computing (applications or key ele-**

ments of an application) on any UNIX (as long as it is AIX), Linux, or Windows server that has affinity for or an intimate relationship to any centralized data managed by a mainframe (think DB2) should be evaluating the zEnterprise Hybrid model seriously. The resulting improved ROI will be found in reduced networking costs, reduced management and operations manpower costs, enhanced security, higher server utilization, and lower overall server costs.

IBM is committed to continue its investments in this arena, but it is my opinion that clients can expect that the capacity and form factor of zEnterprise hybrid components eventually will become much more like those found in the IBM PureSystems (PureFlex) infrastructure offering. zEnterprise clients should also expect that any transitions that will take place will be done non-disruptively with a primary goal of protecting IBM's customers' investments in hardware, software, and management systems.

On the other hand, IBM's PureFlex has the potential to be a powerful solution in many environments, particularly where central management controls and flexible infrastructures are highly valued, including providing complementary server resources in a mainframe datacenter. However, currently it is not capable of providing a comparable level of integration and control that are embodied in the zEnterprise hybrid model that includes the zBX and the Unified Resource Manager. There is room for both in many datacenters and consideration of either should not automatically disqualify consideration of the other.

IBM's zEnterprise hybrid model offers a number of compelling arguments in its favor. These technologies will continue to evolve and likely will take several forms. As such, enterprise IT executives and managers should maintain an active watch on zEnterprise hybridization or possibly forfeit an opportunity to significantly improve their enterprise's bottom line. **If this makes sense, it may be time to stick your toe in the water with zBX.**



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