



Data Center Transformation: Improving Security and Performance with New Server Options

RFG believes the enterprise data center is undergoing significant and sustained transformation, as enterprises seek to build and operate more business-centric, elastic, and secure IT infrastructures. Examples of new demands driving this transformation include more transaction-intensive business services and composite applications built using service-oriented architecture (SOA) principles. These changes can challenge application performance and enterprise security, breaking traditional application design and deployment models and introducing unpredictable workload patterns. Such changes also make it impossible for traditional server architectures alone to deliver enhanced security and higher performance simultaneously. Emerging applications and servers also guarantee that merely "throwing more servers at the problem" will increase risk, and rapidly lead to constraints related to cooling, power, and space. Fortunately, several evolutionary technology trends are converging to offer significant promise to IT executives pursuing effective data center transformation. Specifically, purpose-built IT appliances and engines, until recently focused primarily upon enhancing networking and storage, are now addressing applications and services. IT executives should closely examine these emerging, innovative solutions for addressing their changing business needs, and for consolidating and enhancing data centers and servers in ways that can improve both security and performance.

Business Imperatives:

- Several trends are converging to force significant changes in enterprise data center design and operation. Key among these are increasing demands for delivery of IT resources as services and for "on-demand" enablement of changing portfolios of business services. IT executives must ensure that data center architectures and IT infrastructures at their enterprises can meet these challenges, to maximize the business value of IT investments while minimizing costs and technological and operational risk. In many cases, cooling, power, and space constraints represent some of the most immediate and significant risk factors.
- Server and data center consolidation is often used to increase flexibility and utilization of enterprise applications and other IT resources. Traditional approaches to these efforts often offer only limited performance improvements, and can sometimes even increase complexity and/or vulnerability to security- and compliance-related risks. IT executives should look beyond traditional utilization metrics, incorporating actual workload throughput and user experiences in their evaluations of data center efficiency.
- Purpose-built IT appliances and specialty engines can deliver significant benefits to many enterprises, specifically in areas related to overall security and performance. Newer options can enable enterprises to replace numerous traditional servers with fewer numbers of far more secure and efficient "black boxes." IT executives should examine these offerings and the road maps of companies providing such solutions, for potential specific enterprise deployments, and to form their own future data center plans.

The ultimate goal of IT-business alignment is *enterprise elasticity*, the ability of an enterprise to respond flexibly and gracefully to changing business and/or technological conditions without breaking anything. However, elasticity must be viewed in context and delivered in terms both IT and non-IT personnel can understand and appreciate. IT executives should therefore ensure that their initiatives focus upon specific business needs and benefits, to assure initial and long-term success and support across the enterprise. This approach is essential to effective transformation of today's enterprises into the more agile and elastic organizations their business partners, customers, and decision-makers want and need those enterprises to become.



Based upon the experiences of scores of user clients, RFG has identified seven specific requirements common to almost every enterprise. To provide maximum alignment with and support of business goals, IT executives must collaborate closely with their non-IT colleagues to:

- Cut Costs;
- Drive Revenues;
- Achieve Compliance;
- Improve Governance;
- Increase Business Value;
- Reduce Risks; and
- Transform the Enterprise.

These goals translate directly into several challenges for operators of modern data centers. Some of the most critical of these challenges include the following.

Select Critical Challenges Facing Today's Data Centers

- Consolidation and "Real-Life" Utilization
- Cooling, Power, and Space (and the limits they impose on data center capacity growth)
- The Drive toward Services (including software-as-a-service (SaaS) and SOAs)
- Virtualization (of applications, processing, and storage)

Source: Robert Frances Group

The growing reliance of all types of enterprises upon applications and other IT resources constantly challenges IT organizations to deliver ever-higher levels of performance and availability, despite the ever-higher levels of security and risk mitigation these changes expose. This is especially crucial as security challenges evolve, increasingly forcing enterprises to shift focus from external to internal threats and risks.

For example, SOA deployments allow freer, shared access among various components of composite applications. This can increase the ability of rogue applications or viruses to bring down multiple services at once.

The paired challenges of increasing security and improving performance are often paradoxical, if not antithetical, given the architectural vulnerabilities of traditional servers and data centers. The more capacity added to improve performance, the more vulnerabilities are introduced into the enterprise. This is because every additional server introduces multiple vulnerabilities, especially via server operating systems and network interfaces.

Consolidation and virtualization are seen as ways to address these sometimes conflicting challenges effectively. However, these approaches more often change the nature of the risks faced than they actually reduce overall risk. Furthermore, these solutions do not address performance or scalability, as they focus more on utilization than on performance. Consolidation and virtualization efforts built solely upon traditional server architectures therefore offer only limited benefits, while introducing new types of management complexity.

What Is Needed

IT executives need processes and solutions that enable a concurrent, harmonized increase of both security and performance, at minimal cost and risk, and with no required disruption of IT or business operations. Achievement of these goals, in turn, requires discovery and careful exploration of adjuncts and alternatives to traditional server platforms.



To identify alternatives most appropriate to specific enterprise needs, IT executives must clearly identify the links and interdependencies among key business requirements and supporting IT applications and resources. IT decision-makers must then collaborate with their business counterparts, to define, then agree upon and standardize where possible.

IT should focus first on those combinations of business goals and supporting applications that represent strong candidates for pilot testing of innovative approaches for improving both security and performance. Successful pilots should be used as models for future efforts, which should then be woven together into a consistent, enterprise-wide approach. Throughout these efforts, IT should identify and explore solutions, technologies, and vendors that demonstrate the greatest alignment with enterprise business goals.

Rising to the Challenges

As stated earlier, traditional server architectures alone cannot simultaneously deliver enhanced security and higher performance. Throwing more servers at the problem increases risk, and rapidly leads to cooling, power, and space constraints. Fortunately, new purpose-specific IT appliances and engines are providing advances for data center security and performance that overcome the data center constraints mentioned above.

Dedicated appliances or engines that combine multi-core processing, prodigious amounts of memory, and transparent network connectivity can do for processing what network attached storage (NAS) has done for storage management. Processing and memory resources can be shifted to the workloads that need them on demand, resulting in higher application and service performance levels, without the cost and power challenges that accompany traditional servers and processors.

Regardless of the specifics of IT and business initiatives at their enterprises, IT executives should look carefully for opportunities to get help from strategic vendors that demonstrate vision and understanding of the challenges of data center transformation.

RFG believes **Azul Systems, Inc.** is an example of a vendor worthy of IT executive consideration in this context. The company has taken an innovative approach to increasing server and data center compute capacity, with a concept perhaps best described as "network attached processing," analogous to NAS. Network attached processing, delivered through enterprise compute appliances, provides massive amounts of scalable computing capacity on demand as a shared network service, similarly to how NAS provides shared storage capacity to data centers.

Network attached processing delivers highly secure performance enhancements to enterprise applications and services, such as those running on Java platforms. The Azul solution runs Java Virtual Machines (JVMs) atop a thin, embedded operating system not exposed to the application layer. This avoids the security risks of traditional server operating systems. And, because the appliances only run JVM environments, they leverage the inherent security of Java.

The ability to add secure processing power to data centers and servers, seamlessly and as needed, enables greater efficiencies through resource sharing, higher reliability, less management complexity, lower power and cooling requirements, and more predictable service levels. Network attached processing can also reduce or eliminate the risks and costs associated with speculative capacity planning and over-provisioning for unpredictable application loads, without disruptive infrastructure changes.



Azul has developed what RFG believes is the first example of a network attached processing appliance that connects to incumbent IT infrastructures easily, expands processing resources seamlessly and economically, and delivers measurable benefits rapidly. Azul Compute Appliances can be combined into compute pools that bring significantly increased computing power and memory to applications running on traditional virtual machines. Workload redirection to the Azul platform is rapid and transparent to applications and users across a wide range of operating environments, including Hewlett-Packard Co. (HP)'s HP-UX, IBM Corp.'s AIX, Linux, and Sun Microsystems, Inc.'s Solaris.

Every Azul Compute Appliance leverages from four to 16 of the company's Vega processors, each of which contains 24 discrete cores per chip. Each chip is able to run 24 active threads in parallel, enabling each Compute Appliance to run up to 384 threads simultaneously. In comparison, traditional servers typically rely on chips with only 2 to 4 cores each. Many such chips also support hyperthreading, but this technology merely improves thread queuing, and does not increase the number of active threads that can be executed simultaneously.

The number of active threads that can be executed simultaneously on the Azul Compute Appliances directly translates into performance gains for transaction-intensive applications. As the execution of active threads increases, the number of transactions that can be executed per-clock cycle goes up as well. This results in higher workloads executed at faster response times. For example, Azul recently published the results of performance testing using the JRules Business Rules Management System from **ILOG, Inc.** A traditional AIX deployment augmented with Azul technologies resulted in a 600-percent improvement in throughput at consistently low response times, according to Azul.

Since Azul Compute Appliances act as shared infrastructure elements, multiple Java applications can tap into the additional compute power provided by Azul, transparently and as needed. The Azul solution handles resource allocation tasks, automatically redistributing resources every 10 milliseconds according to business-defined priorities and active workloads. This architecture addresses the dynamic nature of composite SOA applications, as well as services that leverage shared Java components, such as a rules engine or an enterprise service bus (ESB).

Azul Compute Appliances also add power and flexibility to data centers while keeping additional power and cooling requirements to a minimum. These systems consume less power than traditional 4- to 16-way servers, while creating no appreciable additional security risks.

Azul Compute Appliances are 100-percent Java-compatible. They also leverage multiple open source technologies for high performance at low cost, within a straightforward, "black box" appliance that requires no "tweaking" by developers to deliver business benefits.

Azul Systems recently announced that **Credit Suisse (CS)** has decided to implement Azul technology inside its data centers, and to invest in Azul. RFG believes this is a significant win for Azul. Financial services providers such as CS operate highly critical, transaction-intensive IT infrastructures. CS' investments therefore represent credible independent confirmation of Azul and its technologies as worthy of enterprise consideration. Additional enterprises leveraging the Azul solutions include **British Telecom plc (BT)**, **Pegasus Solutions, Inc.**, and the on-demand applications offered by **Selectica, Inc.**

IT executives should strive to do business with vendors that can offer more than "technologies in a box." Azul Systems' solution, its financial strength and investment backing, experienced management team, and successes to date are promising indicators of the company's potential strengths as an enterprise business partner.



RFG believes the evolution of enterprise IT is driving the evolution of enterprise data centers, into flexible, robust, scalable, and secure repositories of computing power. Solutions such as Azul Systems' network attached processing can help to ease and speed this evolution, by delivering additional computing power as needed, without undue additional costs or cooling, power, or security requirements. IT decision-makers should seek out and explore solutions such as those from Azul Systems, which can enable new enterprise services, support new strategic IT and business initiatives, and deliver significant, demonstrable business benefits.

RFG analyst Michael Dortch wrote this Custom Research Note for Azul Systems. Interested readers should contact RFG Client Services to arrange further discussion or an interview with Mr. Dortch.