



## How To Improve Data Center Performance — Egenera Takes Virtualization One Step Further

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### Management Summary

Whether the global economy is in the doldrums or not, it has always made good sense to maximize the use of resources. Enterprise IT executives have known this for some time and have made significant strides to squeeze as much as they can out of their computer assets. **The wide proliferation of individual, separate systems that resulted from the client/server craze had many positive outcomes, but it brought great inefficiencies in how well these systems were being utilized.** Whether it was the server, disk storage or networks, these individual islands of computing power were, collectively, underutilized measurably. On top of that, because many of these systems were individually “owned”, labor costs to support each became a significant cost to the enterprise. A solution, partial, or complete, that would alleviate these problems was needed. **The enterprise was driven to find methods to improve the total performance of IT, and reduce costs, wherever it was found across the enterprise IT landscape.**

Vendors have responded to meet some of these challenges. Network Attached Storage (NAS) and Storage Area Networks (SAN), along with storage virtualization, have begun to show good returns on the investment made in them. Storage utilization has increased dramatically from the typical 40% found in independent storage in or attached to servers. Server consolidation, by combining workloads from two or more servers on one, helped but more was necessary to increase server utilization, which typically runs at 20% - 40% utilization. **It was clear that more needed to be done to improve the overall enterprise IT performance, and bring the cost of hardware and personnel to a more favorable position.**

Egenera Inc. has addressed this problem in a unique way. Storage virtualization has proven to be a worthwhile technology. It is not difficult to see how the advantages found in storage virtualization could be extrapolated to the other major elements of the computing environment - servers and networks - to bring them into the virtualization domain. In accomplishing this, Egenera has virtualized all three elements of a Linux- or Windows-based computing architecture: server, network and storage. **With its unique Intel-based blade hardware called *BladeFrame* and its control software system called *PAN Manager*, Egenera may have the answer sought by enterprise with underutilized servers.** Egenera brings a powerful vehicle for server and network consolidation tool to the enterprise. If you find your enterprise is in need of relief, read on.

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## Improving Data Center Performance – The Challenge

Many enterprises today find it difficult to achieve their goals of profitability and competitiveness in the current slowdown of the global economy. Data centers, which are usually considered cost centers, were logical targets for cost reduction to bring resources in line with the reality of less business growth and sometimes, less business. This would also contribute meaningfully to bottom line results. **IT executives have been given a greater challenge (and, many times, even an ultimatum) and a somewhat paradoxical task to improve data center performance, and do it at a lower cost.**

Consolidating data centers, in particular in those where mainframes were installed, could be accomplished since applications from less powerful mainframe could be combined relatively easily on much larger, more highly scalable mainframes. Storage devices could also be consolidated, with many payoffs in lowering technical administrative. The development of Network Attached Storage (NAS) and Storage Area Networks (SAN) also contributed to real savings. Nevertheless, still more savings in hardware and personnel resources were required.

**The architecture of smaller servers, in particularly those Intel-based, did not easily lend themselves to these methods of reducing costs.** These servers were under-utilized because users had to over-provision for periods of peak computer needs or because they were installed at a time when only one application would be installed on each server. Even when over provisioning was not a problem, computer utilization could be found to be in the range of 15 to 20 percent because the power of the system outstripped the application needs. In addition to these built-in inefficiencies, these islands of computing power had their own legions of technical personnel administering the systems.

## Egenera BladeFrame Responds to the Challenge

**Egenera responds to the challenge of underutilized Intel-based systems, which typically also have had high personnel support requirements.** An Egenera

*BladeFrame* system consists of up to 24 specialized diskless processing blades, which can be configured for processing applications in a variety of ways. **The absence of internal disks facilitates their use as virtual, or as Egenera has designated them, as *anonymous* reassignable processors.** Additionally, contained in each BladeFrame unit are two *Control Blades* and two *Switch Blades*. Both the Control Blades (which contains internal disk memory) and the Switch Blades are designed to maintain redundancy between each type. Control Blades contain *PAN Manager*, the Egenera management software. A unique feature of the BladeFrame system is the BladePlane, the back plane of the system, which also has redundant features. **Because of its unique design, BladeFrame can dramatically reduce the number of connections for network, power supply and storage and ease reconfiguration efforts.**

### *Processing Area Network (PAN) Manager*

At the heart of Egenera's BladeFrame system is the *Pan Manager* operating system. It enables the virtualization of the processor

### Virtualization

What exactly is virtualization? Is it a word that has been used so widely that it has almost lost its real meaning? **Virtualization, in its broadest and most proper definition is a methodology for the abstraction of physical resources.** We have all experienced virtualization long before it began to enjoy popular use in the IT world. For example, we have a choice of buying a car with the traditional clutch and manual shifting or go with the virtualized automatic transmission.

Virtualization in the IT industry has been with us for more than 30 years, starting with mainframes. Memory management and compilers are examples of virtualization that abstracted the resources from the user. Storage has recently been virtualized. Egenera takes this concept one step further by virtualizing the network and the central processor, the other two major elements of a computing system.

blades, and network components. As a result, blades within a frame can be configured to run as blade clusters processing one or more interrelated applications, or any combination. This flexibility of configuration extends to the network as well. The result is a highly scalable system that can respond to the enterprise's IT needs. Pan Manager's flexible software capabilities bring capacity on demand to the Intel based architecture.

### ***Processing Blades***

Each Blade Frame unit consists of 24 two-way or four-way SMP Intel *Xeon* processing blades that can be configured in a variety of ways through the Pan Manager software. The processors can be configured as part of a LPAN, that is a logical set of processors, network and storage allocated to operate in clusters to perform an application set. The processing blades are interconnected by a high speed switching fabric with minimal connections. To provide redundancy to an LPAN, a failure blade can be assigned that will automatically become operational in the event of a blade failure. As an added assurance of redundancy, for continuous operation and, for processor upgrades, blades are hot swappable.

### ***Control Blades***

The PAN Manager software resides in duplicate form on each of two Control Blades utilizing a self contained disk drive. When operating in a normal mode, the blades cooperate in handling external traffic. In the event of failure of one blade, the remaining blade continues operation by itself until the failed blade slot becomes operational again. The Control Blades handle all assigned I/O for the LPANs defined in the system through four connected 2 Gb/sec. Fibre Channel links to a Storage Area Network (SAN) fabric. To handle Internet traffic or other external network, the Control Blades house I/O ports that handle 10/100 BASE-T Ethernet or Gigabit Ethernet

### ***Switch Blades***

The redundant switch blades provide a high-speed interconnection between Processor Blades through the interconnect with properties similar to *InfiniBand*. The process of setting up LPANs through virtual switches, or *vSwitches*, is accomplished through the

switch blades and the PAN Manager. There is unlimited flexibility in configuring an LPAN. One can, in creating an LPAN, assign a vSwitch to connect sets of one or more Processing Blades, or as a means of communication between the system and external network traffic.

### ***BladePlane***

**The BladePlane's creative architecture moves the BladeFrame to a higher level of computing efficiency. It dramatically reduces the effort for set up or reconfiguration.** As few as two network and two storage cables are needed for 24 virtual servers. When one compares that to the effort to install a new server using conventional methods, the results are impressive. Days or weeks are compressed to minutes. The BladePlane carries along with the rest of the BladeFrame system the concept of redundancy. High speed interconnect is made through dual serial buses. Data transfer between blades is done at 200 Mb per second (BladePlane is comprised of two 1.25 Gb/sec. Interconnect) on a point-to-point basis ensuring reliability, and security, since blades not in the authorized LPAN are insulated from the other. Expansion beyond one BladeFrame is easily accomplished. The new BladeFrame can be configured to share the same storage pool as the original.

### ***Supported Software***

The BladeFrame system is designed for Intel-based operating systems and currently supports applications running under Red Hat *Linux* and *Windows Server 2003, Enterprise Edition*. The BladeFrame system interfaces with BMC's *Patrol*, HP *Open View Network Node Manager* and Tivoli's *Enterprise Controller* and any SNMP-based management system. **With the powerful and flexible PAN Manager software, the combination makes the BladeFrame a system that is ready for prime time.**

### **Conclusion**

**There are large numbers of under-utilized servers in most enterprises.** The hidden cost of these overprovisioned systems was rationalized by arguments of improved productivity. Aggravating the cost formula

was the cost of technical personnel to maintain the systems. Easy acquisition by individual departments in the organization spread the inefficiencies throughout the enterprise. To add to the downside of this server sprawl is the lack, complete or otherwise, of providing for backup for short-term downtime or for disaster recovery practices. As is well known, the inability to recover from a sustained interruption or a disaster can be detrimental to the competitive stance of the enterprise and could even severely jeopardize its viability. Even under the less drastic case of short-term interruptions, there is a cost of lost sales or lost customers that goes right to the bottom line of the financial status of the company.

Although there have been many efforts to consolidate servers, many of them failed to measure up to the full potential of consolidation. **Egenera's BladeFrame offers enterprises a proven system that achieves measurable improvements in operating efficiency and at a lower cost than what is being currently experienced.**

In summary, **BladeFrame brings many advantages not available in other products:**

- **Hot plugability in replacing server blades** - either failover (reserve) blades taking over an inoperative blade, or by replacement by new generation of processors when they become available, eliminating the need for *fork lift upgrades* (i.e., total system replacement).
- **Dynamic reallocation of server blades** - to meet increased demands of critical applications or to load balance virtual machines (processing blades), as required within business processing constraints, providing an environment of *capacity on demand* for users. Overall Service Level Agreements (SLAs) can be more easily met through the versatility and flexibility that comes with diskless, anonymous, reassignable processor blades.
- **Total Cost of Ownership** - is less due to higher utilization in the BladeFrame environment as processor utilization is increased dramatically in this environment. Fewer personnel are required to administer a centralized, consolidated BladeFrame

system, reducing costs and helping the IT department to do more with less.

- **The benefits of extended virtualization** – abstracting applications from physical resources – are now extended beyond storage into the network (network switches, fibre channel switches, HBAs and NICs), servers, and CD-ROMS.
- **The flexibility of reconfiguring or deploying computing resources** - reducing the reconfiguration time from days or weeks to minutes.
- **Enhancement of security** - security is enhanced since the PAN Management system provides isolation.
- **BladeFrame supports both the Red Hat Linux and Windows operating systems** - allowing them to run concurrently in one BladeFrame, reducing TCO by changing the infrastructure, protecting the investments made in running applications under these systems

If your enterprise is suffering from server sprawl with all of the inefficiencies of overprovisioning and high cost technical support, take a closer look at Egenera's BladeFrame.



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### ***About the Author***

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