



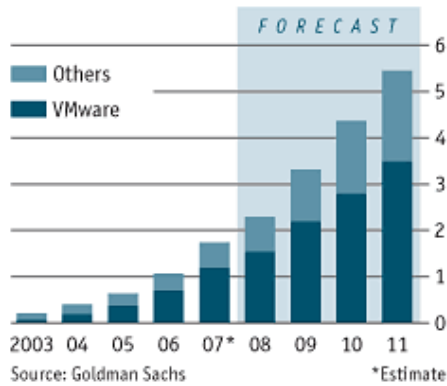
Implementing Virtualized Network Services with Coyote Point Systems' VLB Advanced™

Prepared by: Jim Puchbauer
Coyote Point Systems Inc.



Real money, virtual machines

Virtualisation software market, \$bn



At a projected market of over \$4B by 2010 (Goldman Sachs), virtualization has firmly established itself as one of the most important trends in Information Technology. Virtualization is expected to have a broad influence on the way IT manages infrastructure. Major areas of impact include capital expenditure and ongoing costs, application deployment, green computing, and storage.

But what exactly is virtualization? Who needs it? Who uses it? How can it impact the way end users perceive applications?

At a high level, virtualization is simply an application and its base operating system combined together (encapsulated) in a single compact package. Once paired, this encapsulated solution can be duplicated in multiple instances on single or multiple real servers. These can also be easily migrated to different servers and cloned



for use as needed. By running applications on “virtual hardware” such as VMware’s vSphere 4, IT managers are able to transparently create or shift resources to where they are needed without interrupting business.

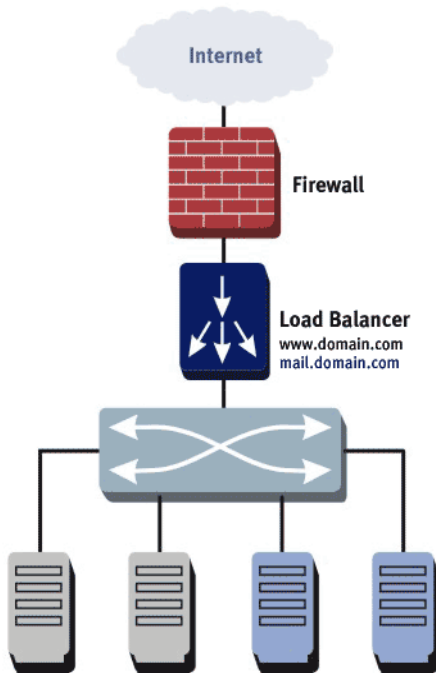
From a business point of view, there are a number of advantages to this approach to computing:

(1) Cost reduction via server consolidation. Making more effective use of underutilized hardware, reducing power and cooling needs.

(2) Improving application availability by abstracting away physical hardware failures

(3) Servers can be moved around easily, even when in use because computers have essentially become bits of software. Getting new ones running takes minutes, not weeks

(4) VMware virtualization allows desktop computers to be managed centrally, called Virtual Desktop Infrastructure (VDI). Operating systems and applications need no longer run on PCs on desks, but can run on virtual machines in the data center that can be accessed remotely from any PC in the world.



These benefits are not only for large enterprises - anyone implementing virtualization can experience these benefits. For Small to Medium Enterprises (SMEs), the cost benefit of reducing power and cooling is especially significant as the cost of energy continues to rise.

Scaling virtualized applications, however, remains an ongoing challenge. In this whitepaper we review why virtualiza-

tion makes sense for the SME, how scaling applications is different in virtual machines, how to manage cost when scaling applications, and finally how Coyote Point Systems' VLB Advanced optimizes Application Load Balancing technology for virtualized infrastructures.

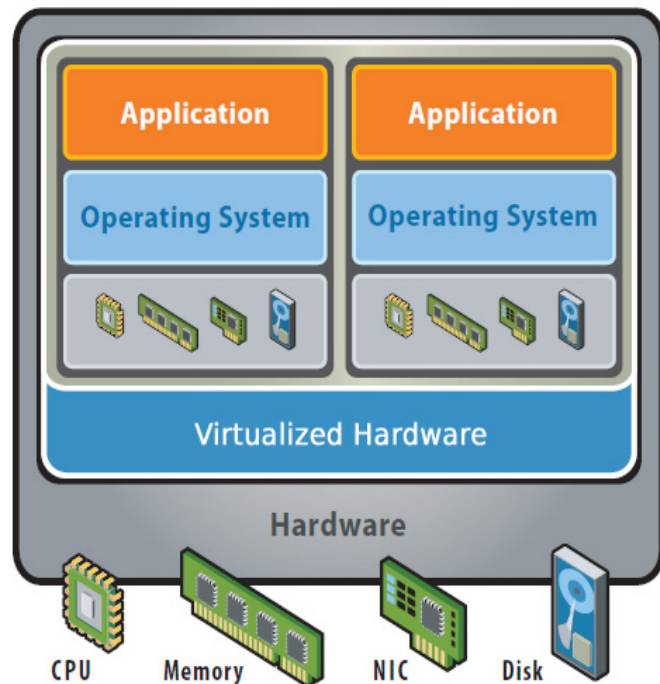
Digging into Virtualization

Virtualization works by allowing operating systems to be installed in a virtual machine. Multiple virtual machines are then run on a single physical server. The software that makes each virtual machine appear as a standalone server is called a hypervisor.

The hypervisor abstracts the physical resources provided by the server hardware into virtualized devices. In this way, for example, a single network interface card, storage device or CPU can be shared transparently among any number of virtual machine instances.

Because each virtual machine has its own operating system and applications, for the most part IT administrators treat virtual machines as they would any other server. The key differences between a physical machine and a virtual machine are:

1. Virtual machines can be cloned.
2. Virtual machines can be moved to different physical servers.
3. Multiple virtual machines can be run on a single physical server.



Being able to clone virtual machines is a tremendously valuable capability as it allows administrators to define a base image that they can then use to instantiate new servers on-demand without physically deploying additional hardware. Thus, the time to roll out a new server can literally shrink to minutes with zero incremental capital outlay.

Moving these virtual machines across physical machines is another immensely valuable feature. By shifting where a virtual machine is run, administrators can perform maintenance on hardware without incurring any downtime. Even better, organizations that require disaster recovery facilities can maintain backup datacenters at a fraction of the cost since virtual machines can be easily moved or created on demand.

One additional difference that may well offer the greatest fiscal benefit, and introduce the greatest risk: that is running multiple virtual machines on one physical server to take advantage of underutilized hardware resources. With this ability, underutilized servers can use their excess capacity to run multiple applications without concern for application integration and testing as each application operates within its own virtual machine. As the cost of power and cooling continue to rise relative to the total cost of ownership, the ability to shut down unused server capacity can translate into significant savings compared to running individual physical servers for each application.

Fine Grained Virtualization

The Risks Inherent in Server Virtualization

On one hand virtualization offers application administrators the benefit of a stable platform that minimizes the challenges of managing sharing of physical computing resources. As we observed earlier, being able to share physical resources is a powerful tool that makes effective use of available server capacity while reducing operational costs.

On the other hand, virtualization completely ignores the reality that a given server has a fixed performance capacity. The result of sharing resources means spikes in any one server's utilization has an adverse impact on all the other virtual servers running on the same physical hardware. For example, if a virtual server running a database application has a spike of queries sent to it, any another virtual server on the same physical hardware may be unable to meet its performance due to the increase in processor load resulting from the database queries. Continuing the example, a virtual server that processes orders from the web site would suddenly deliver slow responses and a poor user experience without an increase in web order traffic because of the load spike to a completely unrelated application or service.

Perhaps the most frequently misunderstood aspect of virtualization with respect to quality of service management is its lack of application awareness. While virtualization management tools are able to monitor and control the operating systems they host, the same is not true for the applications running on those guest operating systems. Virtualization environments are blind to failures or bottlenecks at the application layer, which means that although virtualization infrastructure may consider a guest machine to be healthy according to operating system metrics, the applications running on that server may be completely unresponsive. A real-world example of this scenario is a virtual Windows 2008 server on which Internet Information Server (the web server) has crashed and is not running. So long as the operating system continues to report that the machine is available, the virtualization manager has no way to know that the virtual machine is no longer responding to user requests and should be rebooted.

Coping with Real Time Change

Keeping up with the real time traffic fluctuations requires that load be distributed across servers in an efficient manner. Furthermore, it must be distributed based on observable metrics, such as server latency and application availability. As server performance diminishes, the load must dynamically and transparently be distributed to other available servers.

Highly malleable virtual servers are powerful for all the reasons stated above; however they don't ad-

dress the challenge of being able to incrementally add server capacity and automatically distribute load across them. Thus, a web-enabled application such as Microsoft SharePoint can quickly find itself strapped for capacity when the virtual machine it runs on is out of capacity.

The solution to scaling out applications without having to change the application itself is Application-aware Load Balancing. This core technology of the Coyote Point Equalizer product family, distributes end user requests across multiple servers. From an end user's perspective, there is only one application server.

Coyote Point's Equalizer load balancing technology automates the optimal distribution of traffic (load) across a collection of servers. Once servers are identified and configured, Equalizer's adaptive load balancing features automatically distribute network traffic to a pool of virtual servers. If the pool capacity is uneven due to servers having to share their capacity with other busy virtual machines, Coyote Point automatically detects the uneven latency and sends the new traffic to more responsive servers.

Automating Virtual Server Management

Coyote Point's VLB Advanced™ feature, available for most Equalizer Application Load Balancers, and included in the E650GX model integrates VLB virtualization awareness with Smart Control. Smart Control is a visual scripting language that gives administrators the ability to initiate and run specific actions when predefined series of events are detected. When combined with VLB, Smart Control provides the tools necessary to realize true optimization of computing resources and maximize application availability and performance in a virtualized environment.

One simple but powerful example of VLB Advanced is physical server power management. By configuring Smart Control rules, an administrator can cause unneeded virtual servers to be gracefully shut down during periods of low demand. When traffic has been drained from the excess servers, VLB advanced can then physically power down the hardware previously supporting these machines. When traffic increases, and more virtual servers are required VLB advanced can power up the real servers and cause the necessary virtual servers to be instantiated. This is the only way energy usage can truly be optimized and energy savings can be achieved.

By implementing true load balancing, IT business leaders can insure the optimum use of hardware resources. By effectively managing the distribution of work across compute resources, hot spots are eliminated and the need to overprovision to handle load spikes is removed. The fiscal impact is both in capital expense (fewer servers) as well as operational expenses (power, cooling, and management).

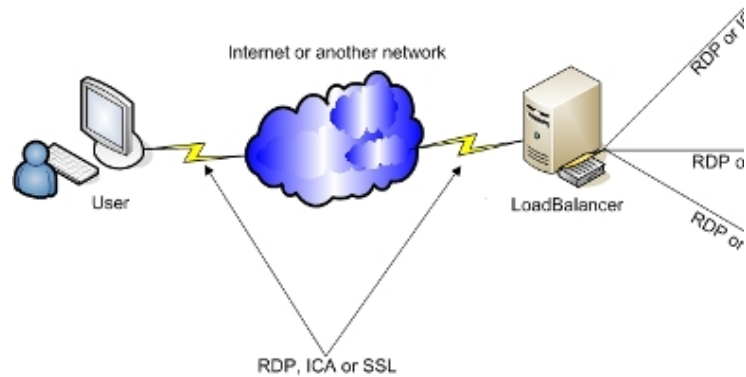
Desktop Virtualization

Virtual Desktop Infrastructure (VDI) is a new trend in virtualization technology. With VDI, end users use thin client software/hardware to connect to datacenter hosted virtual machines via Terminal Services. The end user's working desktop resides within the virtual machine and thus administrators are able to maintain tighter control on the administration of the user's desktop environment. Coyote Point's Equalizer supports VDI through Remote Desktop Load Balancing.

The three significant issues for Terminal Services that Coyote Point addresses are the distribution of new users within the server cluster, maintaining persistence for users that have already established a desktop, and automatically recovering from failed VDI servers.

Distribution of new users is a case where network load balancing comes into play. By tracking the latency of each virtual machine running a desktop operating system, end users are transparently guided to the least loaded machine. This will minimize server response times and guarantee the best user experience.

When that user tries to reconnect to the system later, it is necessary for the network load balancer to redirect the user back to the same machine that processed the original transaction (persistence). Coyote Point load balancers are able to make that determination and transparently route users back to the server on which they have an active session. This eliminates the overhead required to start a new desktop session when an existing one has already been established.



In the event a VDI server becomes unavailable, the load balancer is able to transparently redirect a user to a working server. Terminal Services handles the migration of the user’s desktop and the user experiences zero downtime. Should a server fail, Coyote Point can notify IT management by means of SNMP traps, email alerts or other means.

Using Coyote Point to scale VDI allows IT business leaders to attain the promised operational cost savings that can be gained with VDI in a practical user-friendly way. In addition to the cost savings of using VDI in the first place, the lower training costs associated with only having to teach users to connect to a single IP address for desktop access further simplifies the whole process. This all can be achieved while maintaining the highest levels of user satisfaction based on reliability and performance.

Further Reducing Cost with Hardware Acceleration

As already noted, being able to virtualize a server doesn’t mean that the load itself goes away. Thus, the next step in identifying opportunities to further reduce servers and thereby reduce operational costs is to identify what tasks hardware can do more efficiently than software.

For applications that use the web, compression and SSL are requirements for many of today’s applications. They are necessary to cope with mobile users connecting via high latency networks and maintaining high security in a security conscious landscape. These requirements are also extraordinary consumers of compute resources.

Using dedicated hardware present in Coyote Point's Equalizer E450GX and E650GX products, removing CPU intensive load associated with these two requirements is simple and transparent. Equalizer is able to identify when it is necessary to provide these services and then utilize its own specially designed high performance hardware to do the work that without Equalizer would have to be performed by the virtualized application servers.

The business impact of using Equalizer hardware to offload SSL processing and data compression from application servers is spectacular. A Pentium 4 class system is able to perform approximately 150 SSL transactions/sec . By comparison, a Coyote Point E650GX contains SSL acceleration technology that can deliver up to 12,000 SSL transactions/sec. Thus, the processing workload of a bank of 80 servers performing software SSL can be offloaded by a single Coyote Point system with SSL acceleration. The number of application servers necessary to support application users can then be reduced, as they no longer have to process the numerically intensive SSL handshake and encryption.

Beyond the reduction in management costs and reduction in physical space requirements, the reductions in power and cooling alone over the course of a year can make a significant impact in lowering operational costs.

Integrating With Everyone

Through the VMware Technology Alliance Program, Coyote Point is able to offer tightly coupled solutions for dynamically monitoring, starting and stopping VMware servers. This alliance provides the basis for Equalizer VLB and VLB advanced, and the necessary technology exchange enabling smooth and synergistic integrations.

Equalizer VLB advanced has already been deployed in environments supporting a diverse set of applications. BC Networks, a service provider focused on the healthcare and insurance markets is already using this integrated solution. Dave Brewer, President of BC Networks, specifically cites the value of VMware and Coyote Point when talking about his infrastructure. "The tricky thing with blade [servers running a purpose built combination of VMware and Oracle] is that you need to equip the blades for non-stop availability, which requires the highly intelligent Coyote Point Equalizer Series load balancer."

Summary

Virtualization is likely to be the single most significant Information Technology development of the decade. Leveraging virtualization to reduce costs and attain greater efficiency isn't double-talk - it is something that every company can easily verify themselves using empirical methods.

A critical component to achieving the goals of virtualization is ensuring that the distribution of work is indeed balanced across all of the servers in the compute farm. Coyote Point provides high application availability and load balancing technology optimized for the virtualization environment enabling you to do just that. The proactive management tools provided by Coyote Point's VLB Advanced enable true cost savings and energy conservation. Think of the virtualization infrastructure as a tool kit for deploying

multiple servers on a single physical computer while VLB provides the intelligence to use those tools to their best advantage.

As you evaluate virtualization to see what it can do for your organization, understand how virtualization dramatically impacts server performance. Scaling load, distributing load, and acceleration technologies are all critical elements for success. Furthermore, integration between application load management and virtualization is critical in managing scale.

When selecting a Load Balancing solution for your virtualized server infrastructure, be sure to consider both the native application management abilities of the solution as well as its integration into the virtualized environment.

###

About Coyote Point

Coyote Point has been an application delivery innovator for over 10 years. In 1999 we introduced our first server load balancer and we've shipped thousands of units since then. Today, Coyote Point leads the industry in producing reliable, high performance Application Delivery Controllers that can be scaled to meet any application delivery environment. Coyote Point's Equalizer ADC products are deployed by small, medium and large enterprises, including some of the busiest sites on the web.

At Coyote Point, we pride ourselves on delivering value to our customers. Our products perform as advertised and are easy and enjoyable to use and deploy. With a versatile and powerful architecture, CPS provides the highest value while enabling customers to optimize businesses that rely on Internet-based infrastructure.

Coyote Point is headquartered in San Jose, CA. For more information, go to www.coyotepoint.com, or call us at 1-877-367-2696.