

The Evolution of Advanced Application Hosting at Donet

Introduction

Now, more than ever, businesses are depending on external technology providers to host their critical business applications with minimum downtime. Every moment of downtime can be translated into lost revenue or lost employee productivity -- neither of which is desirable, particularly in a down economy.

The purpose of this white paper is to describe how Donet, over its long history, has addressed increased business pressure for maximum uptime. The technology currently culminates with Donet's Versatile Infrastructure Platform, a highly available virtual machine solution.

Shared Web Hosting

Nearly fifteen years ago, Donet began offering *shared web site* hosting. Shared web site hosting is the most common form of hosting, and with it all the computing resources needed to serve up the web site content is shared among many other users in the same application space. While this setup permits more efficient utilization of resources, and can be hosted very inexpensively, there are often performance and security related issues. Since all the web sites operate in the same application space, the lack of isolation can cause problems when a single web site overloads the resources of the entire server. In other words, all the sites hosted on a shared web server suffer when one site consumes all the resources.

Dedicated Servers

Before too much time passed we encountered customers who needed more than simple shared hosting. Some needed every bit of the server's storage and computing power for their specific application. Others wanted their application or data isolated for security reasons, or so that other customers' high-load sites couldn't take their site down. Finally, others required a third-party application that wouldn't function properly in Donet's shared web site hosting model. When we encountered a customer with needs such as these we would set the customer up with a dedicated machine entirely for their own use.

It seems like an improvement at first: a dedicated server

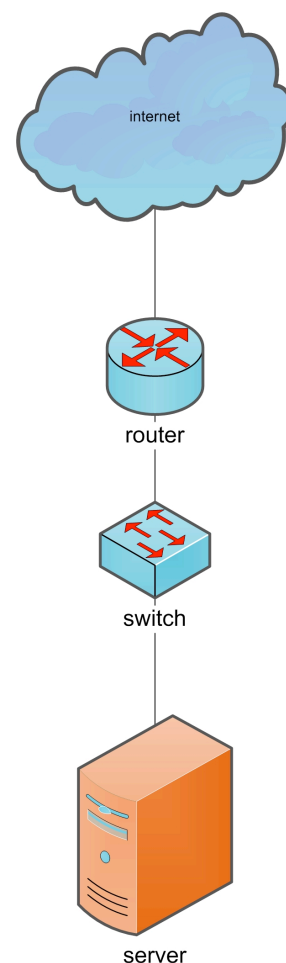


Fig 1. ∴ Dedicated Server

connected to our high-speed network fabric and fast upstream Internet connection (see Fig. 1). The customer benefited because he got a machine all to himself, and could run anything he wanted on it without worrying about the impact other sites might have on his application or data. Ironically, however, simplistic server designs like this often introduced numerous single point failures: there was usually a single server, connected to a single network switch, router, and upstream connection. If any one of those devices or connections failed, the customer’s application also failed. These issues had all been previously solved by our shared web hosting service, but every new dedicated server for a customer recreated the vulnerabilities.

The introduction of dedicated servers simultaneously introduced the need for someone to assume responsibility for server administration to monitor the machine, operating system and application state of health, patch the operating system against exploits, and initiate recovery when a failure was detected. The level of administrative effort required isn’t high, but the server does need to be consistently maintained to remain in a stable state. These tasks were always quietly performed by Donet personnel in the shared hosting environment, but they were frequently overlooked by our dedicated server customers. Without regular maintenance and patches, a software failure or security exploit becomes as likely as a hardware failure: it’s no longer a matter of “if”, it becomes a matter of “when”.

The estimated total operational cost for a single dedicated server, based on a three-year lifespan, can be broken down as follows:

Server Costs	\$3000
Amortized Over 3 years	\$83
Monthly administration labor costs	2 hrs @ \$125/hr = \$250
Monthly co-location costs	\$125
TOTAL MONTHLY OPERATIONAL COST	\$458

Clustered Servers

The single point hardware vulnerabilities inherent in single dedicated server application hosting were quickly identified as a liability, and we developed strategies to overcome them. The next generation of high-availability hosting at Donet took the form of clustering servers together to achieve greater flexibility and application uptime.

Two cluster managers, one primary and the other backup, worked in tandem at the top level of the infrastructure. The job of the cluster manager was to continuously poll two or more application nodes in the layer beneath and route requests accordingly. When a cluster manager detected that an application node had failed or was offline that node was removed from the pool of available resources and requests were no longer directed towards it. Similarly, when the node was returned to an online state, the cluster manager would detect that as well, and the

node would be added back to the application pool to process requests. Shared storage, usually in a RAID-5 minimum configuration, made consistent content available across all application nodes (see Fig 2).

Clustered hardware offered a dramatic improvement in application availability, but the complexity of the setup also increased the workload of the administrator. Instead of one server per application in the standalone model, the administrator now had five machines to configure and maintain. More complicated application designs often segmented the content delivery into separate functional bins (web servers, database servers, etc.), each requiring their own clustering for a highly available application -- adding more machines to the total server count.

The additional manpower to administer a sophisticated cluster obviously drove the costs up, but there were also increased capital costs and monthly recurring hosting expenses. From a capital perspective, a decent physical server with a three-year vendor maintenance contract typically costs \$3,000, so the five server cluster shown would require a minimum capital outlay of \$15,000 for three years of useful server life.

Significantly more investment would be required if the shared storage was a high-speed SAN with minimum RAID-5 data striping, potentially adding another \$10,000 to \$20,000 to the initial hardware investment. Finally, monthly recurring costs would be charged by a data center to cover the monthly recurring co-location fees for the five servers. Co-location charges alone for a typical five-server power and bandwidth footprint could account for at least \$600/mo in recurring fees.

The estimated total operational cost for a cluster of five servers, based on a three-year lifespan, can be broken down as follows:

Server Costs (per server)	\$3000
Amortized Over 3 years (per server)	\$83
Monthly administration labor costs (per server)	2 hrs @ \$125/hr = \$250

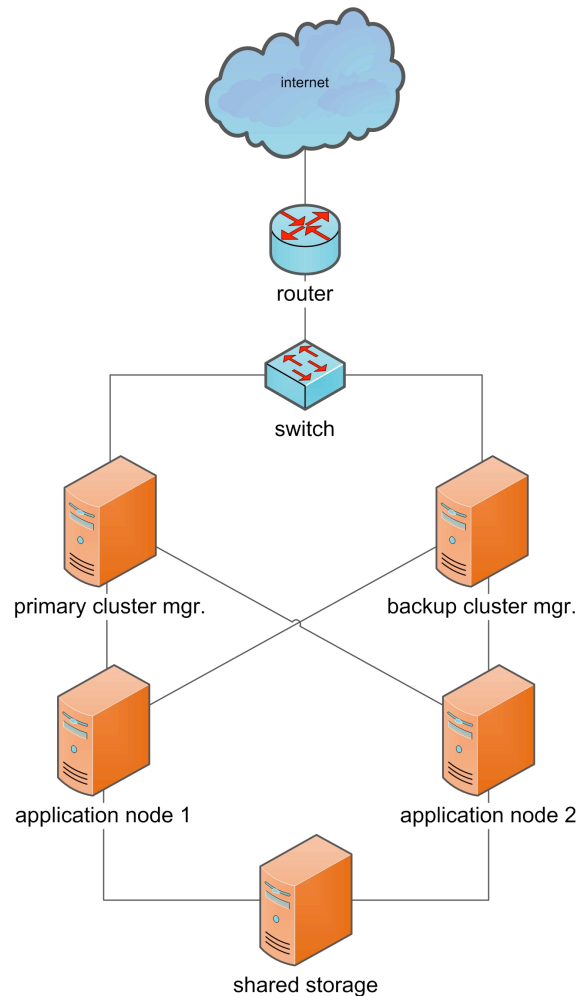


Fig 2. ∴ Clustered Servers

Monthly co-location costs (per server)	\$125
TOTAL MONTHLY OPERATIONAL COST (per server)	\$458
TOTAL MONTHLY OPERATIONAL COST FOR A FIVE SERVER CLUSTER	\$2,290

Enter Donet's Virtual Machine, the *Versatile Infrastructure Platform*

Carefully implemented over a three year period, the Versatile Infrastructure Platform (VIP) is Donet's first offering of highly-available infrastructure as a service using VMware software and Donet's server and network architecture. This powerful combination is designed to be flexible, scalable, and fault-tolerant.

The virtual machine is a mature concept as computing innovations go, and VMware has been the dominant technology provider since the late 1990s. Studies have shown that most physical servers are often underutilized, on average running at 10% of their full capacity. To reclaim this wasted potential, we run multiple virtual machine instances in self-contained server program spaces, each with their own isolated operating system, data store, and user space, on one physical machine.

The costs savings offered by virtualization are often significant enough on their own to warrant investment in the technology, but there are other benefits gained related to reliability. Using VMware's Virtual Infrastructure Center (VIC), VMware's patented VMotion technology, and Donet's high performance storage area network (SAN), the failure of a physical host running multiple guest instances is quickly

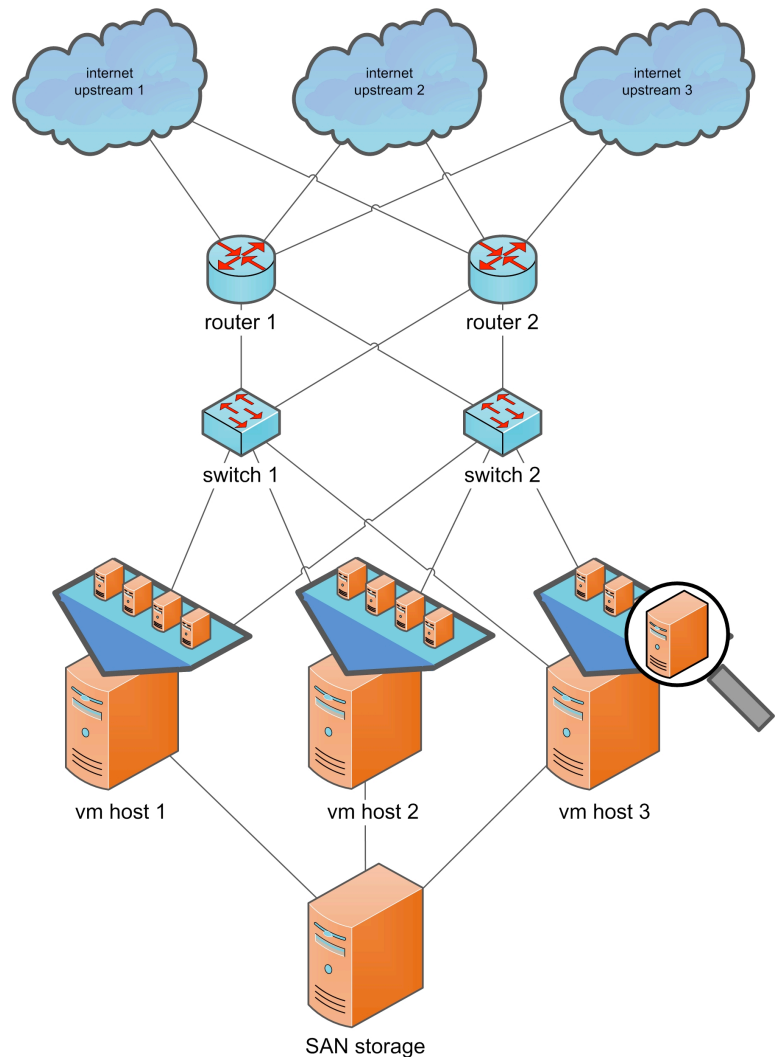


Fig 3. .: Virtual Machine

overcome. Each guest host that was previously running inside a failed physical host is transparently moved by the VIC to a surviving physical host, resulting in near-continuous uptime for your critical business applications in the face of catastrophic hardware failure. Furthermore, redundancy at every level of Donet’s VM infrastructure, including the network switching fabric and routing layer to our upstream providers, guarantees that all single point failures threatening access to your data and your application have been removed. The result is peace of mind that could only be approximated by a costly multi-server cluster plugged into multiple upstream carriers, at a price point that is now within your reach.

An additional benefit of Donet’s VIP worth mentioning is that computing resources can be flexibly provisioned according to business demands. Consider, for example, an online store with cyclical traffic patterns that begin to increase around Thanksgiving and drop quickly after New Years. During the low points in traffic, Donet can tune the resources needed to a minimum configuration, saving the business money. Conversely, during times of peak traffic additional resources can be added and paid for at the time they are needed most. In cases of extreme load, additional virtual machine instances could also be created to process requests temporarily and destroyed when the load decreased. This kind of flexible on-the-fly provisioning, and associated service provider billing, would be extremely difficult, perhaps impossible, to replicate in the physical server world.

The estimated total operational cost for a typical VIP instance is quite a bit different to model than its physical server counterpart. There are no servers to buy. To take full advantage of the highly-available computing platform one needs only to host a single VIP instance with Donet. The typical costs associated with hosting a VIP instance capable of running Windows 2008 with Donet are as follows¹:

VIP instance with 4GB of RAM, 40GB of SAN, 100GB/mo of bandwidth transfer	\$357
Monthly administration labor costs	2 hrs @ \$125/hr = \$250
TOTAL MONTHLY OPERATIONAL COST	\$607

The bottom line is that for just slightly more than the cost of your own single physical server, and for significantly less than the cost of a full physical server cluster, you can get a highly-available and fault-tolerant Versatile Infrastructure Platform instance from Donet.

SPLA Licensing Benefits

One of the benefits of hosting a VIP instance with Donet rather than trying to build your own highly-available physical cluster is that you can take full advantage of Donet’s relationship with

¹ Donet’s VIP instances are capable of running a variety of operating systems, including Microsoft Windows. We also support Debian, Ubuntu, and CentOS. VIP instances running Linux distributions usually require fewer resources and, as a result, have a smaller monthly operational cost.

Microsoft. Through Microsoft’s Service Provider License Agreement (SPLA) program, Donet can offer advanced Microsoft software using a monthly subscription model rather than having to invest thousands of dollars on software purchases. The SPLA program entitles you to the latest versions of supported Microsoft products without having to purchase costly software upgrades, and there is no long-term commitment required.

To help you get a sense of your potential costs savings, consider the chart below. For each of the major Microsoft software products considered, the purchase price using the standard retail model is shown along with Donet’s SPLA monthly subscription pricing model.

Microsoft Product	Retail Purchase Price	Donet SPLA Monthly Subscription Price
Windows Server 2008 R2, Standard Edition	\$799 \$199 per 5 additional CALs	\$5.00/mo per user
Exchange Server 2010, Standard Edition	\$1,250 \$53 per 5 additional CALs	\$2.60/mo per user
SQL Server 2008, Standard Edition	\$1,859 \$810 per 5 additional CALs	\$9.50/mo per user
SharePoint Server 2007 for Internet Sites	\$41,134 plus \$1,999 for Windows Server 2008 External Connector License	\$998.00/mo

As you can see, the initial investment required to purchase full editions of most Microsoft products is not at all trivial. Using the full purchase model, a business wanting to host a SharePoint for Internet Sites server would need to get Windows Server 2008 (\$799), SQL Server 2008 (\$1859), and SharePoint Server 2007 (\$41,134 + \$1,999), for a total software investment of \$45,791. In time, as software upgrade became available, this customer would need to invest thousands more in upgrade packages. By comparison, a Donet VIP customer taking advantage of our SPLA licensing program would be able to get their SharePoint for Internet Sites server up and running for a minimal monthly cost of \$1,012.50. This customer would typically save thousands of dollars with the SPLA subscription based pricing over the expected lifespan of the software.

Optional Services

Donet offers additional services to help you focus on your core business while we take care of the technology behind your critical business application. You can outsource the system administration to our capable staff and we’ll monitor the server 24x7x365, respond to outages as they occur, and quickly implement repairs should an operating system component fail. We’ll also patch your system with the latest software updates on a monthly basis, which helps harden your system against external threats. We can also perform remote data backups to our secondary data center using EMC’s Avamar backup grid, one of the fastest and most reliable

backup and restore products available today. Storing your priceless business data offsite is just one more layer of security for you in the event of a catastrophe, adding peace of mind.

Summary

Our system and network engineers are available to help you select the right combination of services for your specific business needs. Whether it be protecting your data with a hardware firewall, or making your hosted VIP instance appear as a physical machine on your office local area network, we've got the experience, imagination, and expertise to take on your technical challenge.

Call Donet today and let us help design and host a reliable, highly-available, and fault-tolerant solution for your critical business application!