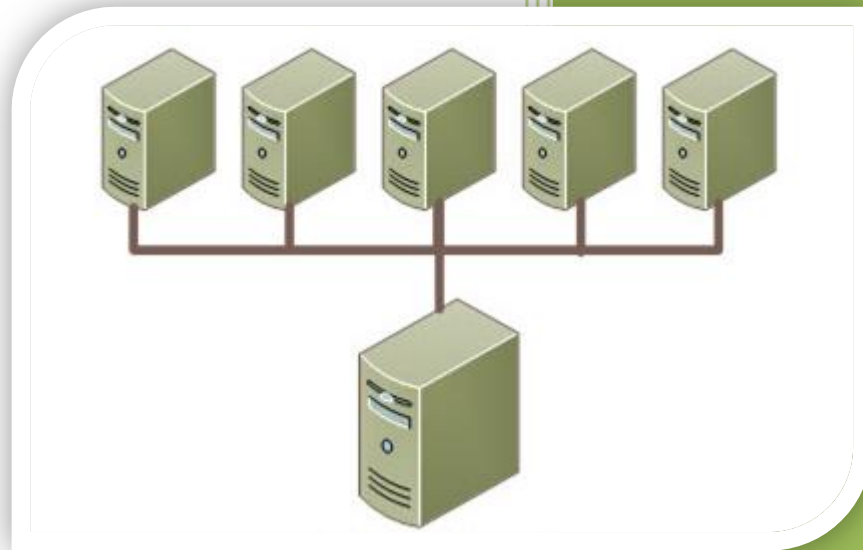


# VPS

## Virtual Private Server



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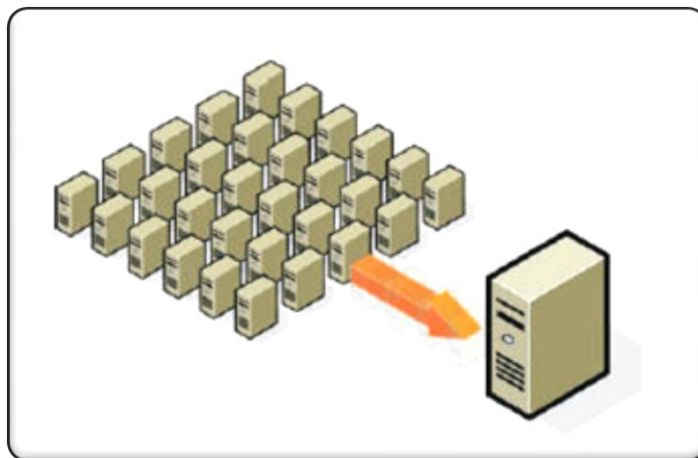
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# 1. Introduction:

A Web server is a high quality computer frame that delivers or serves content, information, and other resources that can be gathered through services. One goal of having web servers is to provide Web hosting services that allows individuals and organizations to make their own website accessible via the World Wide Web. Typically, web hosts are companies that provide space on a server they own or lease for use by their clients, as well as providing Internet connectivity; which is called a data center. Some individuals and organizations, for example, have universities with their own web servers and hosting services. However, there are two kinds of web hosting, shared and unshared. Shared web hosting is where many websites reside on one web server connected to the Internet. Each site resides on its own partition, or section/place on the server to keep it separate from other sites. Those sites share the web server resources, such as CPU, memory, storage, IPs, connection, and the like. This is generally the most economical option for hosting, as many people share the overall cost of server maintenance. Information resources, in other words, have been reevaluated and become incapable to be transferred across the internet. As a result, the performance was inconvenient even though the internet connection had gotten faster. Therefore, companies started distributing their web servers around the world, which is basically the technique of distribution systems. Recently, there have been distributed physical servers globally in many countries that belong to one company dedicated to serve as fast as possible. According to Akamai, which is a leading company in web hosting services, states that *“Akamai has created a digital operating environment for the Web. Our global platform of thousands of specially-equipped servers helps the Internet withstand the crush of daily requests for rich, dynamic, and interactive content, transactions, and applications. When delivering on these requests, Akamai detects and avoids Internet problem spots and vulnerabilities, to ensure Websites perform optimally, media and software download flawlessly, and applications perform reliably. [1]”*.

On top of that, some individuals and organizations started demanding independency. That means they wanted to have their own web server with no sharing, especially those who had a lot of content and information rather than popularity. This idea gives them the ability to setup convenient resources for them. The resources all elements that are involved in a web server for both hardware (such as the processor, memory, storages and the like), and software (such as operating systems, applications, bandwidth, root access and more. This idea could be very smart, but this technique is expensive and difficult as well. It is needed to be working even it costs a lot since it needs a lot of hardware, software, cool, power, and maintenance. Not only does that cost, but also the distribution system would significantly cost for setting up physical web servers everywhere. These distributed servers need data centers at every distribution system location. The smart ideal scheme that many hosting companies are getting is based on virtualization.

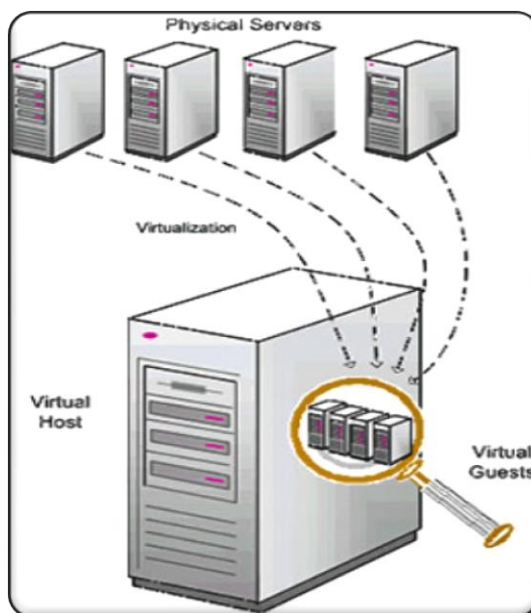


Virtualization can be defined as the approach that refers to the abstraction of computer resources by having software act as the actual hardware. Based on that, we began to see the term of virtual computers; Virtual machines (VMs) are unreal computers no matter which class they are. Basically, they run and execute applications like real physical machines. According to Wikipedia definition of a virtual machine, it is said that “*virtual machine was originally defined by Popek and Goldberg as "an efficient, isolated duplicate of a real machine". Current use includes virtual machines which have no direct correspondence to any real hardware. [2]*”

In this paper, we are going to focus on virtualization based web servers. They are widely used and strongly based on virtualization which have contributed to great business success..

## 2. VPS Technicality

VPS stands for virtual private server which definitely means having the independency of managing the entire resource of the server with no partner. It is virtually administered. The management aspect means a customer has total and absolute control of the private server and is able to do whatever he or she wants to do. It differs from shared server that you have to follow what the server consists of and what resources it contains rather than the settings that may not be convenient for some customers' applications, or does not have the functional ability to run their programs. According to Scott, the System Administrator of Eukhost hosting company, says that *“SHARED HOSTING is like living in an apartment building and sharing your neighbours' problems. You hear their music through the wall. If one of them leaves the main door open, your security is at risk. On a shared server, all the website hostings share the operating system and resources. Problems with your neighbours' website hostings can slow down the server performance or require it to be shut down while the problem is being fixed. The slowdowns may also resulted from having too many website hostings on a server. Your site's security depends in part on decisions made by your web host and, perhaps, your neighbors too.[3]”* he adds that *“VPS Hosting HOSTING is more like living in a townhouse with your own private yard, and without ever hearing your neighbors. The only common area you share is the parking area and entrance; all traffic goes through one network port. In contrast to apartments or shared hosting accounts, you pay more for a VPS Hosting, but you can do what you want with the space, and your neighbors' problems aren't your problems.[3]”*



Based on the reasons stated above, many customers like to have their privacy with less cost, but that cannot happen with the high cost of hardware and maintenance. However, nothing is impossible in that there is always a way that customers can have their private servers take advantage of virtualization techniques. At this point, we can use VPS as the best solution to provide independent servers with not much cost. In addition, by

providing the reliability and the flexibility to VPS, they can be trusted and used in most types of businesses.

The VPS scheme works basically by having many kinds of virtual web servers on top of an actual or physical web server. VPS share only a certain amount of the physical web server resources. Each VPS is given a specific feature for each resource that it can use. As a result, other busy or overloaded VPS web servers cannot affect their *neighbor* web servers. This property is considered the most significant feature of VPS efficiency. This particular VPS feature is different from reseller techniques. To define *reseller* hosting is a hosting technique where an account owner has the ability to use his or her allotted hard drive space and bandwidth to host websites. The reseller purchases the host's services wholesale and then sells them to customers for a profit. A certain portion of hard drive and bandwidth is allocated to the reseller account. The reseller may rent a dedicated server from a hosting company or resell shared hosting services. The reseller account is simply given the permission to sell a certain amount of disk space and bandwidth to his own customers without renting a server from the web hosting company. However, this is a great difference from VPS since VPS has the root access and strict resources utilization capability, . Any busy website can affect other websites and resellers since all of them share the same expanded amount of resources.

Virtualization systems give each VPS a fixed amount of resources consumables. VPS servers can only consume what they are given. When a VPS server is being overloaded, it is only the overloaded server and may go down without damaging the other VPS servers that are sharing the same physical server. When a machine runs, a virtualization software has the operating system of the VPS run as it is actually running on top of physical hardware.

The amazing thing in virtualization systems is that most operating system can be run no matter which physical hardware a web server has. Another interesting thing is that whenever the setting of hardware needs to be changed or expanded, it can be done via virtualization systems which have the ability to change, copy, back up, and modify VPS servers.

VPS web page on Wikipedia says “*Virtual private servers bridge the gap between shared web hosting services and dedicated hosting services, giving independence from other customers of the VPS service in software terms but at less cost than a physical dedicated server. As a VPS runs its own copy of its operating system, customers have super user-level access to that operating system instance, and can install almost any software that runs on the OS. Certain software does not run well in a virtualized environment, including firewalls, anti-virus clients, and indeed virtualizers themselves; some VPS providers place further restrictions, but they are generally lax compared to those in shared hosting environments. Due to the number of virtualization clients typically running on a single machine, a VPS generally has limited processor time, RAM, and disk space.* [4]”

A VPS lies in-between shared web hosting and dedicated hosting in the spectrum of both control and power. A VPS system is a self-contained dedicated server which lives on a server with other VPS systems. As stated previously VPS systems are also known as virtual dedicated systems because they give the control of a full dedicated server but are housed on a real physical server with other VPS systems. You get a good deal of flexibility with a VPS system since you gain the control, performance isolation and flexibility of a dedicated server while only having to pay for a portion of the server itself.

[6]

### 3. VPS architecture

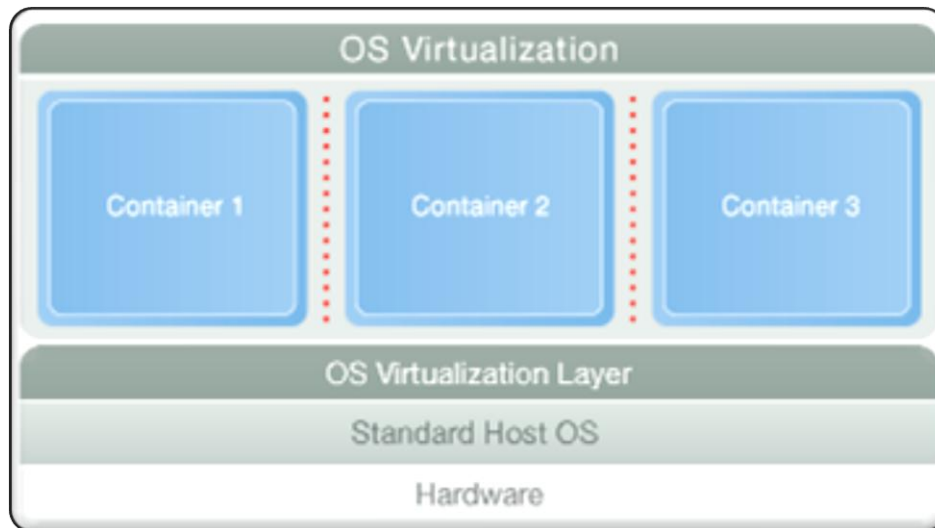
VPS architecture is based on Operating System virtualization that provides the most effective use of hardware, software, and server resources. Each VPS performs exactly like a stand-alone server. VPS's can be rebooted independently, as well as, have independent virtual objects such as root, users, IP addresses, processors, applications, settings, and files and folders.

In fact, there are at least three prime elements for VPS architecture:

- Operating system-level virtualization
- Networking Virtualization
- Resource Management

#### 3.1. Operating system-level virtualization

Operating system-level virtualization is defined as a server virtualization method that instead of just having one server, the kernel allows multiple isolated instances to run at the same time and use the same operating system hardware.. Virtual machines or servers work as if they are real servers and may even look and feel like a real server to the owners or roots. In addition to isolation mechanisms, the kernel often provides resource management features to limit the impact of one container's activities to the other containers.



OS virtualization is widely used in virtual hosting environments. Wikipedia states that *“it is useful for securely allocating finite hardware resources amongst a large number of mutually-distrusting users. It is also used, to a lesser extent, for consolidating server hardware by moving services on separate hosts into containers on the one server. Other typical scenarios include separating several applications to separate containers for improved security, hardware independence, and added resource management features. OS virtualization implementations that are capable of live migration can be used for dynamic load balancing of containers between nodes in a cluster. [4]”*

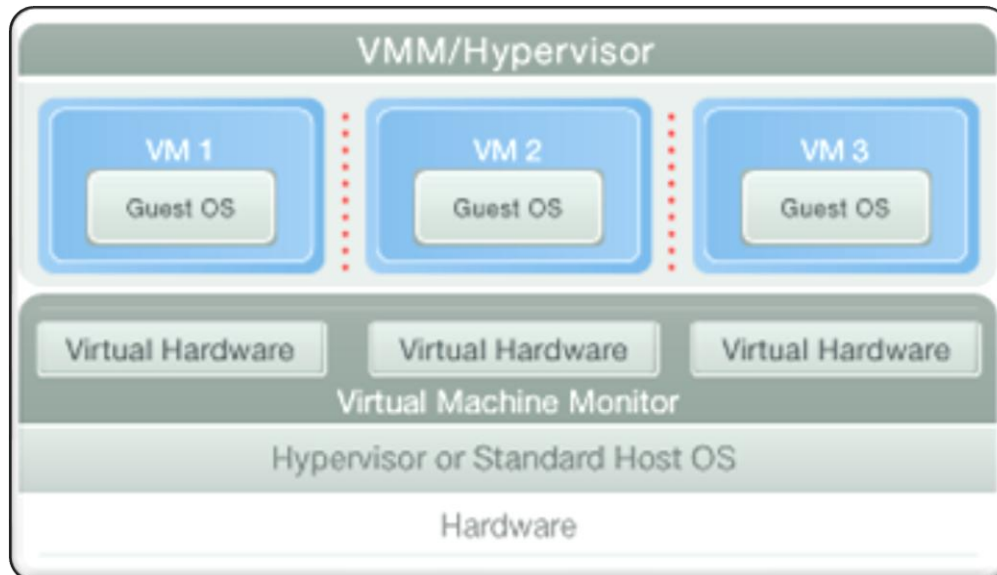


For a VPS environment, OS virtualization gives each VPS the opportunity to act as if it is an independent system. This independency is provided by a virtualization layer in the kernel of the host operating system. This layer is built between the physical operating system and the virtual instance. At this moment, a question may be considered asking “how much virtualization consumes CPU resources?” Parallels company, the most popular producer of OS virtualization, states that “*Note that only a negligible part of the CPU resources is spent on virtualization (around 1-2%).*” [6]”

Virtualization layers play the main role implemented in OS virtualization. It makes any VPS system perform exactly like a regular system. It adapts to make the VPS install, boot, process, run programs, communicate with others, and do so with no modifications or adjustment. In addition, any Virtual Private Server root can change any configuration file and install additional software. By using this layer, Virtual Private Servers are completely isolated from each other and no one can cause harm to the others. However, Virtual Private Servers are not bound to only one CPU, but can use all available CPUs since processing can be scheduled to all available CPUs.

An important thing that the virtualization layer does is that it constructs separately isolated containers on a single physical server with an OS instance to utilize hardware, software, data center and management efforts with maximum efficiency. The containers can be resembled as a machine, but done so virtually.

Another element that is considered to be a link between virtualized OS and real OS is Hypervisor Virtualization. Hypervisor Virtualization according to Parallels, “*has a base layer (usually a thin Linux kernel shown here as a hypervisor or standard OS) that is loaded directly on the bare server. To allocate hardware and resources to the virtual machines (VMs), all hardware on the server must be virtualized. The next layer up shows each chip, board, etc. that must be virtualized so that it can be assigned to the VMs. Once in the VM itself, there is a complete copy of an operating system and finally the application or workload.*” [6]”



## 3.2 Networking Virtualization

Networks and communications are considered the relevant environment that VPS servers are made for. Because of having virtual machines that work as if they are real machines, we need to consider that virtualized networking entities must be built up to make VPS servers communicate through virtual networks and nodes. In this particular element we can virtualize the main tools of networking such as, network interface card (NIC), routers, gateways, directors and the like. These virtualized entities can act based on actual and physical networking entities such as IP addresses, network media, protocol, network applications, and so on. By making what we mentioned, we can have two distributed VPS servers talk to each other across the world.

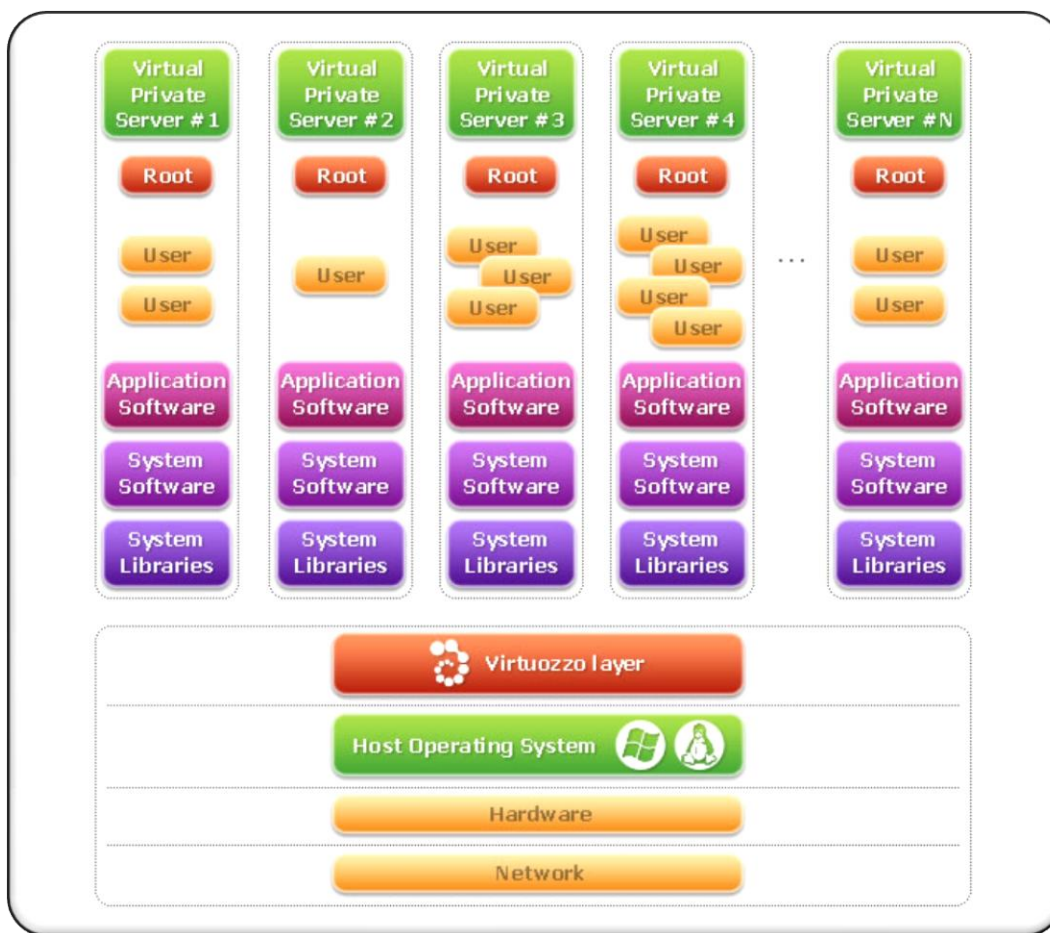
The virtualization software contributes mainly through the network virtualization layer to isolate VPS servers from each other and from the physical network. VPS servers can be used as a router, gateway, server, IDS device, director, tunnel, and any kind of networking node, especially Linux based VPS servers. Therefore, a VPS server can actually assign one unique IP address, or some times, multiple unique IP addresses. Network traffic is isolated and distributed between the VPS servers. Securely, Virtual Private Servers are protected from each other in the way that makes traffic snooping impossible. Not only do VPS servers have these abilities, but also protection and firewalling can be setup internally in VPS servers by creating security rules to limit access to some services or protecting the VPS servers by optimizing the canonical IP-tables tool in the system of the VPS servers. Routing tables can manipulate the communication and networking of a VPS server and do advanced routing features to support VPS server networking.

## 3.3 Resource Management

This technique is considered the manager of OS virtualization since it controls the amount of resources available for each Virtual Private Server. It has entire control to manage the utilization of the resources by specifying either fixed or dynamic parameters based on their configurations. These parameters can be CPU power, disk space, a set of memory-related parameters, number of NICs, swap memory, bandwidth, services, etc. The Resource Manager or controller takes care of sharing available hardware and node resources among VPS servers. This can ensure Quality of Service (QoS) with providing the optimum performance and resource isolation rather than protecting VPS servers from DDoS attack or undefined and unknown remote control. Resource Management provide the ability of monitoring the system

Generally we can realize that a VPS server consists of some important components that are dependent on each other, They are gradually merged in the;

- 1) Virtual server operating system.
- 2) Virtualization software.
- 3) Operating system.
- 4) Physical server.
- 5) Network.



The Galaxy Visions institution bases its VPS servers on Virtuozzo Virtualization System which is produced and supported by Parallels, the popular company in Virtualization and Automation Software. Galaxy Visions company accentuates that *”As an Operating System virtualization solution, the unique architecture enables the most efficient use of hardware, software and management resources. The light overhead and efficient design of Virtuozzo makes it the right virtualization choice for server consolidation, disaster recovery and production servers with live applications and data.[7]”*

## 4. VPS performance

### 4.1. Performance factors

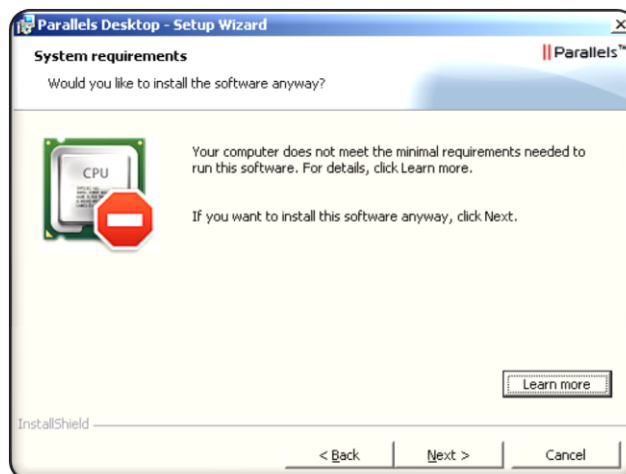
Usually, a VPS server performs slower than the physical web server since it is limited in system resources. Rather, the traffic has to go through a producer that is between actualization and virtualization. In fact, there are also some influential factors that affect VPS performance.

#### 4.1.1 The specifications of the Physical Server:

To run several virtual servers on top of a real server, the real server must have the capability to handle processing and running the virtual servers commands. Therefore, we must consider how much the physical server has the ability to run a virtualization system, rather than how many virtual servers can be run on this actual server without having slow performance or the lack of response in temporary or permanent. The most effective components of this point are CPU, memory, storage, inventorial quality and hardware compatibility. Any lack of performance or quality of one component may affect the entire performance. According to Parallels, in Parallels Desktop 4 for Windows & Linux Datasheet, it is stated that a “1.5 Ghz or higher processor (64-bit processor is requires for launching 64-bit guest operating systems). [10]”

#### 4.1.2 Virtualization Systems:

A VPS server performance differs based on one virtualization system to another virtualization system. Some virtualization systems focus on running virtual machines as fast as they can, however, other virtualization systems want to ensure the reliability that virtual servers undergo strict procedures and advanced techniques that require high quality real servers to cover the latency that may happen. An important factor is that some virtualization systems require certain types of specifications such as CPU type, memory, storage space, NIC cards, and as so. In addition, they also require a specific amount of CPU frequency, RAM capability, and storage space. In my experience, when I try to run Parallels Desktop 4 for Windows on my desktop that has high specifications, (Intel 2.5 GH Duo Core, 6 GB RAM, 500 GB HDD), I encounter a message sayinf “Your computer’s CPU does not support hardware virtualization, which means that you can only create Parallels virtual machines but not run them”. Therefore, we must know which hardware can support Virtualization Systems. Moreover, some Virtualization Systems are strict that they require certain operating systems. Parallels, in Parallels® Virtuozzo containers data sheet, specifies “Any x86 or x64 platform supported by Windows Server 2008 & Windows Server 2003 (Intel, AMD or similar) as well as IA64 for Windows Server 2003. [12]” is supported.



#### 4.1.3 Virtual Machines:

A VPS server needs enough specific resources or convenient configurations that are involved in speeding up the VPS server performance. We must consider the purpose of the VPS server so that we can consider the optimum configuration that guarantee running the VPS server as efficiently as possible

#### 4.1.4 Network:

Networks play a big role in web server performance. Assuming there is the highest quality web server that is fast, reliable and professional, it may perform efficiently locally, but no one can ensure it is going to perform fast or respond quickly if the network is slow or constructed inefficiently. The same idea can be applied on Virtual private servers. Assuming the previous factors are successfully applied and virtual private servers perform perfectly locally, they will not perform as efficient globally as they do locally if the network configurations are not efficient. For example, if we ran this ideal physical server on 10 Gbps network, virtual private servers will not perform similarly as fast since if the physical server runs on 100 Mbps network.

#### 4.1.5 Applications:

A Linux or Windows VPS server performance may be affected by the applications that are installed and run on it rather than the amount of bandwidth or disk space that is required for them. In other words, some applications should not be run on a VPS server since they require a lot of memory space and CPU consumption. Some application can produce a lot of throughputs that may consume high percentage of CPU, bandwidth, RAM, and storage. Because of that, the VPS server will perform slowly, otherwise, it will require more resources.

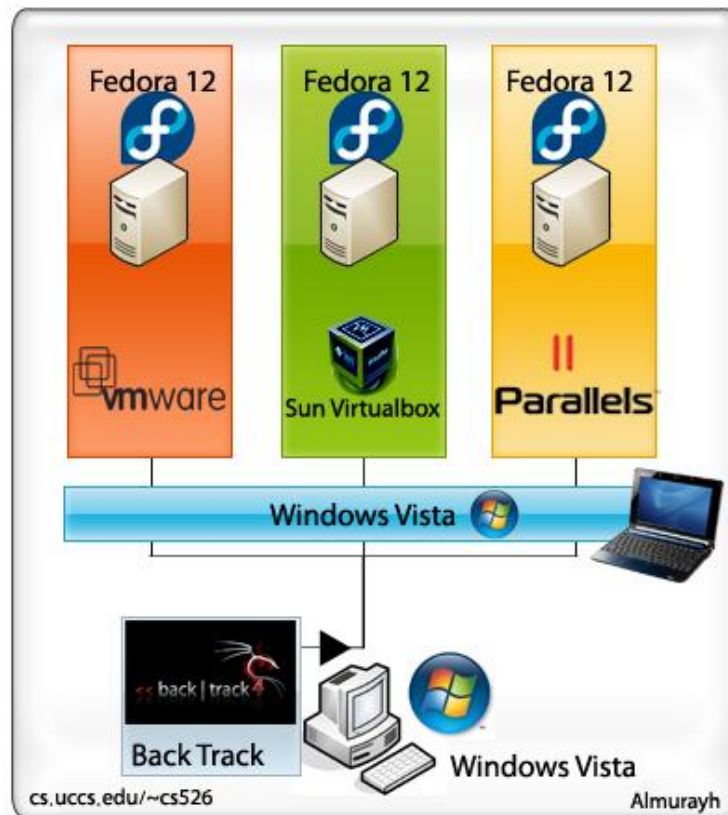
### 4.2 VPS Performance Comparisons:

Based on the previous effective factors, we need to specify which benchmarks can be used and what is needed to be measured. Hence, in the first comparison, we want to measure how a unique VPS server performs individually on a virtualization

system. This case is going to be applied on three different virtualization systems such Parallels, VMware, and Sun Virtualbox. This measurement intends to figure out how virtualization systems can be effective to VPS server performance. The second experiment is to run the three VPS servers, each one on a different platform of virtualization systems.

To compare two or more VPS servers they must have the exact components, i.e., operating system, applications, services, CPU, memory, storage, physical machine, base operation system, and so on. However, these VPS servers are going to be setup based on different virtualization systems. Through this optimization we can realize how the VPS servers perform in the case where they are shared and unshared.

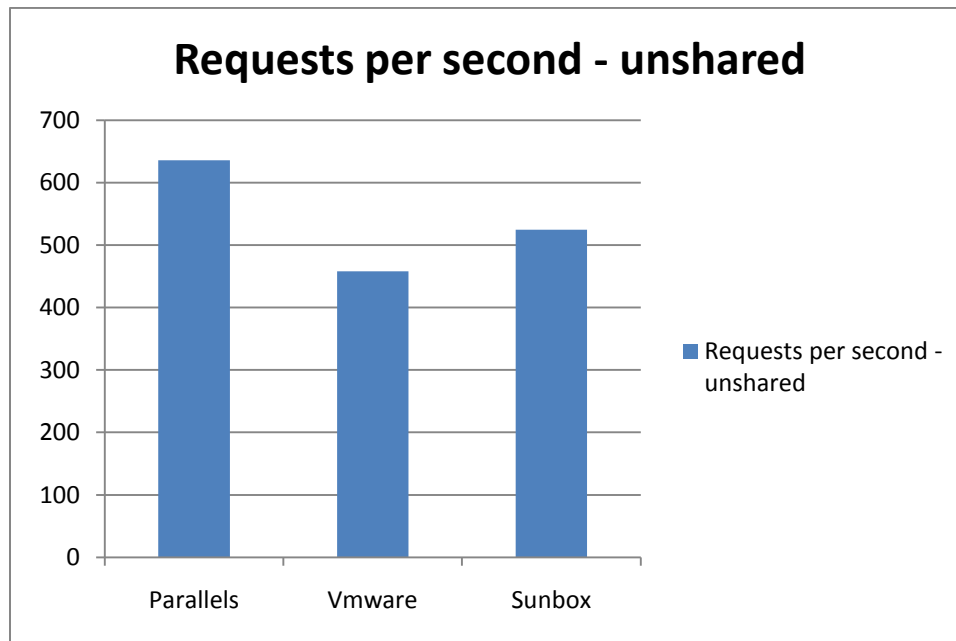
The figure below shows that there are three exact VPS servers that have similar amounts of resources, operating systems, configurations, applications, and services. However, each VPS server has a different platform and those entire platforms have the same platform of the physical hardware. Another virtual Linux machine is setup to measure the three VPS server performances.



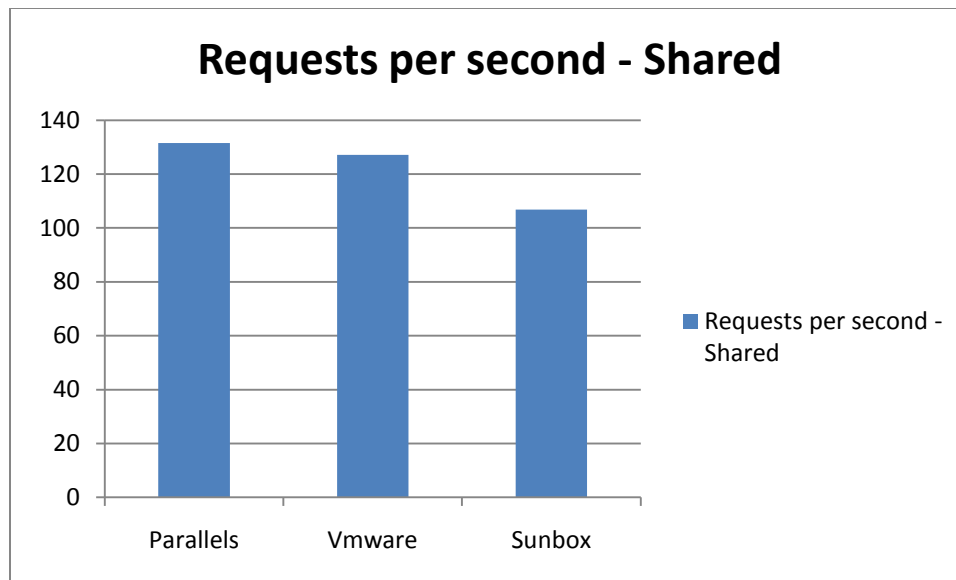
The table below shows how many requests each VPS server can handle per second in the case of each VPS server runs alone and the others are down, and also when all of them run together. As a result, in the first case, the VPS server that runs on Parallels is the faster to respond. However, while Sun Virtual box is faster than VMware in the first case, VMware performs faster and can handle the resource contention while all platforms are running at the same moment.

VM platform	Requests per second (unshared)	Requests per second (Shared)
Parallels	635.91	131.57
Vmware	458.12	127.09
Sunbox	524.39	106.84

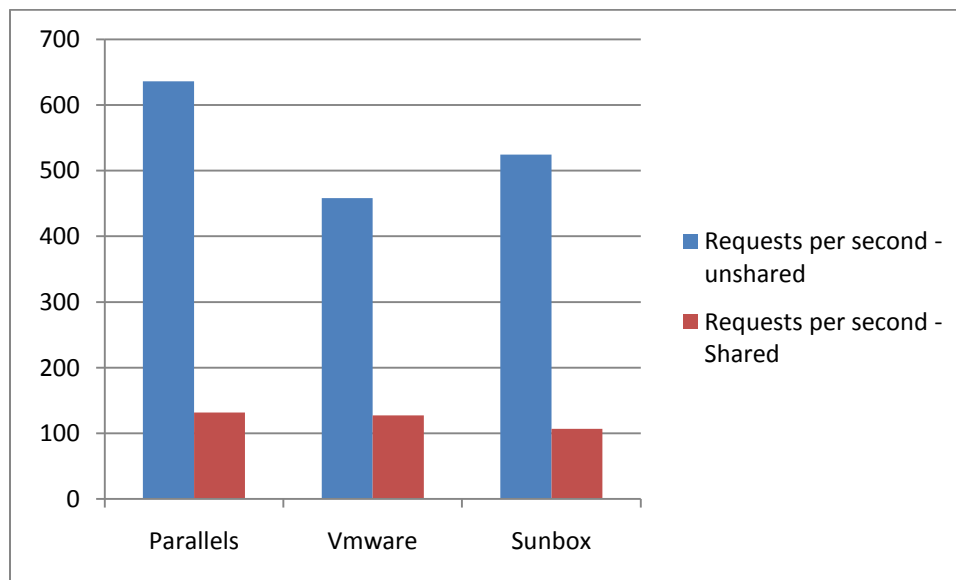
As each VPS server was run individually, the rate of requests per second is much higher than the case that they were run together. However, the interesting thing as it is shown in the plot below parallels seemed a good platform since could perform better than the others. In addition, Sun Virtualbox had a reasonable performance compared to VMware.



When they, on the other hand, were run together the result had dropped roughly in how many requests per second they can handle. In fact, Parallels, for example, had dropped about 80% of requests per second when there were other VPS servers and platforms were sharing the host machine. Overall, Parallels was still be able to maintain being the best platform; however, VMware could success over Sun VirtualBox when it was shared by the others.



The chart bellow shows how much the amount of dropping requests per second when they were running at the same moment.





## 5. VPS Features:

VPS has been a great hosting technique business.. Today, we have seen many businesses, organizations, schools, companies, people, and as so many have converted their outputs onto VPS servers. However, the number of VPS servers has been growing until recently. This practical phenomenon has appeared because of some significant reasons that convinced people to publish their productions through the easiest way, based on VPS servers which have web sites on the Internet. Some of these features that can be considered but counted or limited are:

**5.1. Isolation:** VPS servers are totally isolated in many kinds of resources. A VPS server has its own resources that another VPS server cannot affect or consume its' resources, i.e, CPU, memory, storage and so on. According to Galaxy Visions company, its home page addresses that *“secure virtual private servers ( VPS ) or virtual environments on a single physical server enabling better server utilization, ensuring guaranteed resources and preventing applications from conflicting. Each VPS performs and executes exactly like a stand-alone server. VPSs can be rebooted independently and have independent users, IP addresses, processes, system libraries and configuration files.[7]”* In a shared hosting environment you are 'held hostage' to the actions of others. If another shared account runs a script that crashes the server then your site goes down too. With a virtual private server you have complete resource isolation, and no matter what another cloud server user does will not affect your server.

**5.2. Flexibility:** In fact, this feature is considered an attractive advantage because a user has the ability to install his own applications without the hosting provider's assistance. The most important thing is that any VPS administrator can have root access, which is definitely total freedom. Actually, what makes VPS hosting so comparable to a dedicated server is the control and flexibility it grants to the VPS administrator. In most arrangements, he has the option of utilizing various provided applications or adding his own custom applications. This is the advantage of having root access that allows owners to interact independently with their VPS servers. Generally, owners can customize their servers and services since they are allowed to create applications in whatever programming technologies are installed on the servers.

**5.3 Dynamicity:** With using a VPS server, the owner has the ease of mind to determine the performance of the server and know that performance will never be affected by other hosted sites. However, it would be the easiest way to upgrade the VPS server based on its needs accordingly to the results of the performance test. Consequently, upgrading to a higher resource VPS is simple with absolutely no downtime and can be accomplished on a live environment. This can be done by reconfiguring and optimizing the settings of the VPS server while it is working without the need to reboot it or even shut it down. The changes can be applied dynamically and immediately. The most interesting thing is that there is no need for making physically efforts since everything is virtualized. For example, if the capacity of the hard drive storage is about 80 GB and the owner wants to upgrade it to 120 GB, he can just type the number of the new capacity without installing a new physical hard drive. Another thought on the word dynamicity is that, the

configurations of a VPS server can be setup to reconfigure or upgrade itself based on its dynamic needs without the need of intervention of the owner.

**5.4 End User control:** Mentioning some of the above features, all of them can be done remotely without being work on at the physical server that hosts VPS servers. Graphical user interfaces (GUIs) give the owners of VPS servers the ability to work on their VPS servers and interact with their interfaces as they are in reality. And sometimes these tools are called Virtual Console which is defined as a browser based graphical user interface for running multiple virtual machines on one device.



**5.4 Disaster Recovery:** In fact, there are different kinds of disasters, some of them are considered major and the others are minor. Minor disasters are issues that happen accidentally and can be managed remotely. An example of this kind of disasters can be when there are some services that are down and need to be brought back up. Therefore, by using a browser or console based on a GUI tool, the owner is able to restart, troubleshoot, backup and restore his own VPS server without the help of his provider. Some disaster can be managed too, but they happen rarely which are, when the system goes bad and needs to be reinstalled, upgraded, or even patched. In this case, with no worries, the owner can do them easily and remotely. He can also restart the core server components such as Apache, FTP, and DNS. He can even deploy a fresh OS with his former VPS account. data Many major kinds of disasters cannot be managed remotely and need human intervention. They are such disasters of a physical nature such as physical failures, power outages, nature disasters, so that the owners have nothing they can do for that. This problem occurs in terms of physical hosting as well, but it is easier to manage manually. For example, if a physical server crashes and it is impossible to run it again, we can just replace it with a new server and restore all VPS servers within minutes. For professional work, there are other techniques such as cloud hosting, virtual distribution systems, and the like that whenever a physical server that hosts VPS

servers goes down, the traffic dynamically changes to another host that is healthily running.

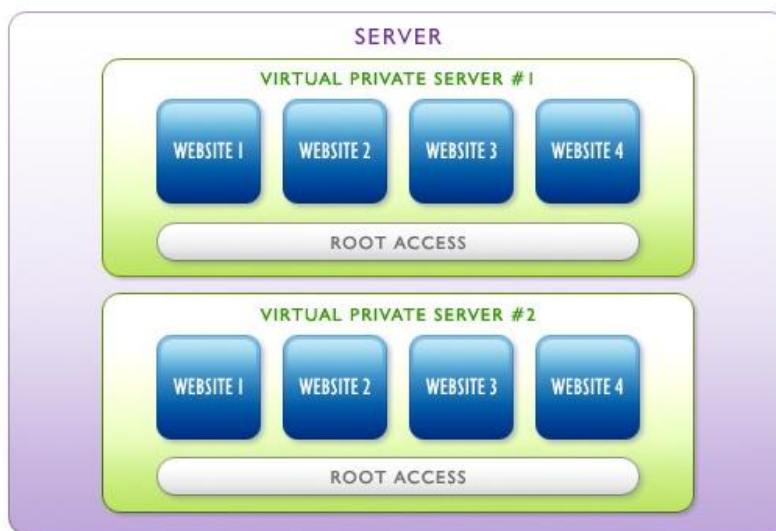
**5.5. Scalable and Upgradeable:** As a VPS server owner you can easily upgrade or add resources to your existing plan based on how much his business grows. He can specify the services that must be setup on his VPS servers to meet the needs or goals. Not only can that be done, but also VPS servers give the opportunity to scale those services accordingly to its usages by increasing some services and reducing or even disabling some services to utilize the server as much as it can. Some services need to be upgraded, but the applications that run on this service are sometimes not ready to be run on upgraded services due to incompatibility. Some services, on the other hand, sometimes need to be upgraded for security purposes or compatibility needs; therefore, they can be easily upgraded without affecting other hosts.

**5.6. Performance:** Isolated hosting is powerful with more flexibility than regular shared hosting. It simplifies the determination of how much VPS server hosting performance and how much consumables are needed. It is easier to decide whether a busy website needs more resources or not. It is true that shared hosting can perform much faster; however, a busy website can affect the host server and cause latency of responding for the other websites that use the same resources, rather than shutting down the services or the entire system. In fact, a VPS server utilizes virtualization technology that provides outstanding performance to any VPS account. Each VPS server in the environment will continue to receive a guaranteed amount of CPU, memory and network resources, and the like no matter how other VPS servers are performing.

According to Virtacore Systems Institution, their website states that “In a shared environment resources go to the site 'that shouts the loudest' in other words a big site can drain all resources and leave yours performing badly. In a virtual private server environment you are guaranteed a set of resources to ensure your site always performs at full speed, these resource guarantees ensure other Cloud servers have no affect on the performance of your site. [13]”

**5.6 Security:** In a traditional shared hosting environment, one account can access other's files when not secured properly. It is a well known fact that people can read other users passwords located in PHP files since they are all running under the web server's privileges and can gain access to sensitive data. A virtual private server can ensure far better security than what is provided on a shared hosting platform. With the server running in the comfort of its own isolated environment, you are shielded from the stability and security issues originated by other users. Though a dedicated server offers the best performance and security, VPS hosting is not too far behind. With a virtual private server your file system is not accessible or viewable by any other Cloud server owner; unlike a shared environment where anyone with shell access can browse through your files. A Cloud server ensures full privacy and security.

**5.7. Host Unlimited Websites:** Manage an unlimited number of websites using a simple interface with administrator, reseller, and client level views. In addition, you can install applications, assign resources, brand client control panels and run your own web, mail, and FTP servers.



## **5.8 Incredible savings:**

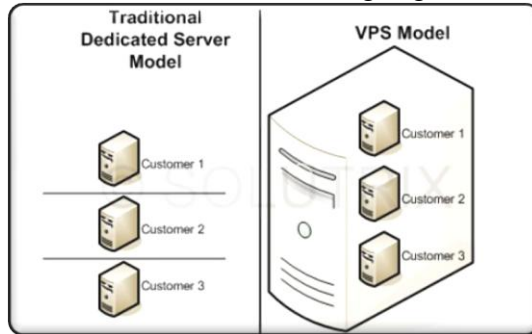
**5.8.1 Cost:** Virtual Private Servers are a middle ground between less expensive shared hosting and dedicated hosting. As such, they are perfect for clients who need the isolation, stability and flexibility of a dedicated server, at a lower cost.

**5.8.2 Power:** Using the virtualization technique reduces the number of physical servers which absolutely decreases the power consumption and the energy waste. Not only does it help us in saving the power, but it also basically reduces the heat that is produced by the huge number of servers that need to be cooled by using a lot of giant air conditioners.

**5.8.3 Nature:** Since we can reduce power consumption, energy loss, heat producing, and so on, the natural resources would be saved. This way can be a solution for global warming that has become a serious problem.

**5.8.4 Space:** This is an interesting thing about VPS hosting in that by combining tens of servers into a physical server through using the virtualization technique, there no need for a lot of space or having big

locations to establish hosting organizations.



## 6. VPS Automation:

Automation is the use of control systems. In the VPS server case such as programmable logic control, in concert with other applications of control information technology for machinery and processes, the need for human intervention is dramatically reduced. VPS hosting needs additional software that controls the resource flow and manage the activities of the VPS servers based on the permissions and setting that they are given. Automation plays an increasingly important role in the world economy and in daily experience. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities. There are kinds of VPS automation that we are concerned with. First, Virtual Automation streamlines operations and reduces complexity of managing physical and VPS servers. Through self-service and automation, administrator's can lower costs and efficiently manage their infrastructure from anywhere. Second, Hosting Automation manages the resources and protects the other VPS servers to not be impacted by busy VPS servers, rather than control the resources flow. The last concern is Billing Automation that computes and calculates the cost of each VPS server based on the reported consumption that is issued by Hosting Automation.

**6.1 Virtual Automation:** This technique is considered so that the automatic supervisor makes decisions based on some standard terms that a human being is willing to take. According to Parallels that have produced Parallels Virtual Automation that have been used widely, their webpage states *“Parallels Virtual Automation, formerly Parallels Infrastructure Manager, is the industry’s first comprehensive management solution that streamlines operations and reduces complexity of managing physical and virtual servers — including both containers and virtual machines. Through self-service and automation, administrator’s can lower costs and efficiently manage their infrastructure from anywhere. [16]”*. Virtual automation can play many roles without human intervention such as:

- Role-based policies for access and configuration changes across all virtual environments by individual users or groups of users
- Policies for offline access to all virtual environments
- Console alerts to prevent resource issues from affecting virtual server performance
- Session management to view all operations performed by users on assigned virtual environments
- API and SDK for customer extensions including charge back, accounting and automation
- Library of ISO images and templates for hardened foundations to reduce configuration errors

- Identification of top resource consumers for fast problem identification to keep you ahead of problems before they affect end users
- Real-time and historical statistics to quickly identify and diagnose trends
- “Warm” migration of virtual machines across physical servers in a paused state
- Summary listing of all software licensing for audit and compliance reporting
- Drill down capabilities into each virtual environment to monitor resources

**6.1 Hosting Automation:** Sometimes it is called “Control Panel” which is software that automates common tasks for web hosting or other services that are provided online. In addition, it allows a server administrator to set up new websites, reseller accounts, e-mail accounts, and DNS entries through a web-based interface. The administrator can create client and site templates, which pre-determine resource allocation parameters for the domains and/or clients. It is easy to use for even non-expert clients. In fact, this kind of software comes with all integration, which means it has different interfaces based on the purpose of the use of each one. Typically, it consists of root control panel, reseller control panel, and client control panels. There are many companies that produce the control panel and they are used widely such as; Plasek that is produced by Parallels Company, Cpanel which is produced by Cpanel Inc., and Admin Direct which is produced and supported by JBMC Software Company. Other control panels that have been used are Baifox, EBox, EHCP, H-Sphere, Hosting Controller, ISPConfig, Lxadmin, SysCP, Virtualmin, Webmin, and more. The reasons for using control panel widely is because of ease of use, speed and saving time, and stability by avoiding downtime by automatically recovering from crashes. What the control panels can do is they can play the role of the administrator, but automatically and dynamically with more precise control. According to Cpanel, their website says their product “Web Host Manager”; *“cPanel provides an intuitive interface to help website owners manage their sites, while WebHost Manager (WHM) automates server management tasks for server administrators. Together, they reduce overhead by simplifying complex tasks and allowing customers to manage their own accounts. [15]”* There are some important and common activities that control panels involve during day and night, such as:

- Configuring VPS server.
- Limiting the specified resources and features for customers
- Setting up and modifying customer accounts;
- Receiving alerts if the server goes down or any service fails
- Installing applications and programming language modules
- Creating and applying hosting plans
- Blocking spam
- Integrate new web technologies and the like

## **6.2 Billing Automation**

Billing Automation is considered as the best way for saving money for hosting providers when they have to manage costs. It is also improves customer satisfaction by giving the customer the total freedom to perform server configuration and maintenance tasks. Billing Automation means no more manual processes by using web-based control panels that can have hosting providers scale their business to support hundreds of thousands of customers.

For example, Parallels Business Automation standard has provided some different business managers that take care of service plans, customer communication, and billing operations as well as other operations managers with managing hardware, configurations, and applications. These managers are automatable and work based on some scale that is set by the providers to have the customers be billed based on their choices and configurations.

Parallels has categorized this manager, or directors into [17]:

- Account Director allows providers to manage customer accounts, partner/reseller enrollment, subscriptions overview, credit terms setup, and customer care
- Billing Director provides a complete billing system for a service provider's business, including: account balances, customer receivables, reseller support, promotions, discounts, taxation, hosting plan management, and revenue reports
- Commerce Director allows providers to configure the online store, online payment and bank transfer tools, transaction log, payments processing setup and encryption for credit cards/bank accounts and much more
- Service Director provides system-level administration of all types of services covered by Parallels Business Automation Standard: Plesk Control Panel Shared, Virtuozzo Containers VPS, Dedicated, Sitebuilder add-ons, IP addresses, Domains and DNS, and much more
- Configuration Director provides system-wide configuration including role-based access permissions, events and actions setup, regional settings and more

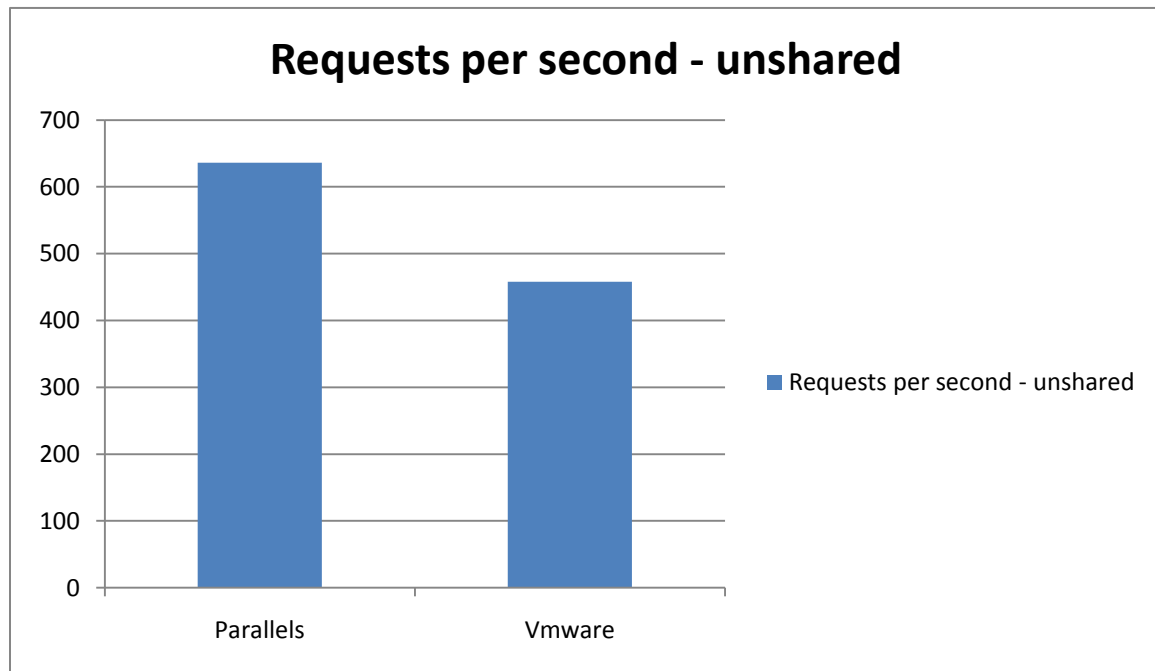
Migration Director provides tools for data migration into Parallels Business Automation, including XML export/import and direct migration from remote servers

## **7. VPS Enhancement**

The over-all features of a VPS server performs slowly because a request has to go through two platforms. The first one is the host operating system, and the other is the virtual operating system. The effective terms are explained in part 3 VPS performance. In fact, there is an experiment that was applied on three VPS servers versus actual servers and the result of how many requests per second is significantly different. VPS servers have given very low result while actual servers give very much higher results.



vm	Requests per sec
VPS1	17.91
VPS2	13.39
VPS3	18.12
viva	2166.64
A210-01	2056.58
uccs	261.89
walrus	9981.51



Not only is the performance one problem a VPS server has, but also data guarantee reliability is an important case as well. There are customers that do not like having their data be virtual, being concerned for any problem that can happen to the virtual hard drive that causes data loss.

Consequently, many companies had to take steps to solve these problems. Some of the solutions are:

**7.1. Storage computation:** This technique has different methods of computing storages that can help servers to perform much faster and reliable as well. SAS/SATA hard disk drive (HDD) and solid state disk (SSD) extensions with linkage via standard serial attached SCSI (SAS) protocol and enclosure services linked via SES firmware Storage Expansion JBOD array enables simple capacity extension, with linkage via standard serial attached SCSI (SAS) protocol and enclosure services linked via SES firmware.

**7.2. Distribution System:** Distributing systems in this case means having multiple VPS servers in different geographic locations based on where the majority of visitors come

from. This idea can help to reduce the load on a VPS by clustering the clients based on their performance.

**7.3 Data isolation:** This practical technique is for data guarantees that with isolating the data to another physical storage, data can be retrieved even the VPS server is down or gets damaged. It is easy to be implemented by using VPS automation techniques and the storage computations that have been mentioned above. Another technique that can be used is when scheduling a backup routine

**7.4 VPS server optimization:** Most clients assume that the VPS servers have been already optimized; however, that is not true since the images that are used for VPS servers may have all kind of services and optimizations that are not needed. Therefore, these optimizations cause the VPS servers to perform slowly. There are some more common ways that give the best performance from a VPS server. These optimizations can be disabling useless system services, configuring MySQL and Apache to not use a lot of the memory or caches, disabling unnecessary modules or plug-ins to give more resources for the software, disabling control panels if they are not needed, and uninstalling the unnecessary or useless applications that consume a lot of disk spaces and memory usage.

## 7. Conclusion:

Virtual private servers are also known as virtual dedicated servers. This server technology splits a single physical server into multiple virtual servers. This practice of dividing a single virtual server to make it appear as multiple virtual servers has been commonly observed in mainframe computers. Of lately, there has been a sudden appearance lately with the development of software and technologies such as VMware, Xen, FreeBSD Jail, User-mode Linux, Linux-VServer, FreeVPS, OpenVZ, and Virtuozzo. Of notable concern is the Parallels, VMware, and Sun Virtualbox solutions. Tests with these platforms show significant differences in requests per second in shared and unshared configurations, with unshared configurations showing 4-5 times better performance. It should be noted that the specific configuration should be carefully considered to meet the requirements of the users' specific needs. Each configuration will have its benefits, advantages and disadvantages. Virtual private servers offer greater flexibility and control while offering less cost per instance. Security can be a priority and a VPS can be configured with this requirement.

The Internet hosting service industry is using VPS hosting for shared web hosting service and dedicated hosting services. Many hosting companies are becoming a foundation that allows root-level access to individual clients without requiring physical server administration and the problems of physically dedicated servers. Cost is minimized and benefits of isolated virtual systems can be realized in a virtual environment, Virtualization is becoming a popular customized solution. A single physical server might have two virtual private servers running. One VPS can host a live website and a second may have a copy of it. Most providers offer both Linux and Windows VPS Hosting and numerous various special configurations are possible.

As VPS becomes more popular and the solution is being adopted more, it will be interesting to see how security, performance, flexibility, performance, and cost will be affected. The benefit of a VPS appears to outweigh the problems experienced with physical servers; however, there are those that are resistant to change. As the technology is gaining considerable attention, it would be reasonable to expect greater acceptance by those considering hosting services.

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