# Option #1: Enterprise Virtualization Implementation Proposal for Solar Panel Manufacturing Company

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I have been hired as a Virtualization Administrator for a solar panel manufacturing company. They wish to grow their organization and offer their services to other organizations nationwide. However, their current IT infrastructure does not support this desired growth. The CIO of this solar panel manufacturing company wishes to develop a plan for virtualizing their current physical architecture. I am tasked with finding an approach that best suites the virtual environment for deploying applications as well as discussing a virtual appliance that is to be used. It's important that high availability is achieved within a virtual environment to ensure that virtual machines are always running with minimal downtime. When making the transition from a physical environment to a virtual environment, there are many challenges that will be met along the way. Finally, a design layout will be illustrated for the virtual environment.

### Deploying Applications

When deploying applications within a virtual environment, there are three main servers that are typically deployed: Web, Application, and Database servers. Currently, the solar panel manufacturer has multiple physical servers for each. The approach that will be used is a three-tier

architecture-virtual design (uCertify, 2011). The host physical server that is to harbor these three applications needs to have enough hardware resources for each set of applications. Each set of application servers will have a virtual switch configured so that they have internet access. The servers will go through a Demilitarized Zone (DMZ) to ensure that threat actors cannot trace operations to the organization's network. A firewall will be implemented between the web servers and the application and database servers. This will ensure that both the application and database servers are protected from external threats. Load balancers are also placed between these servers so that the workloads are balanced equally between all web, application, and database servers. They will also redirect traffic in the case where a server fails. If any one of these servers fail, a new virtual machine can be created from a template. This approach for deploying applications will ensure that server workloads are balanced equally with each other and that internet is effectively provided to them via virtual switches. The application and database servers are also protected from external threats due to the firewall between the web servers and the application and database servers.

## Virtual Appliance

Virtual appliances are prebuilt virtual machines that already contain everything needed to deploy an application (uCertify, 2011). Virtual appliances do not require the patching and maintenance of traditional operating systems. This is because the operating system is an open-source deployment. Virtual appliances are typically delivered in Open Virtualization Format (OVF) to ensure that they can be quickly deployed on a hypervisor. Many reputable virtualization providers such as VMWare, Oracle, Jumpbox, and Vagrant provide virtual appliances. For example, VMWare provides many virtual appliances for database purposes. Percona Server for MySQL is a virtual appliance that was packaged by Bitnami. Percona Server is an open-source replacement for MySQL. It offers many features such as extra storage engines and more granular performance metrics. It supports additional encryption, compression, and scalability options and can be used in enterprise environments. When a virtual appliance needs to be updated, the entire virtual appliance is replaced to minimize the time needed to deploy a new release. This virtual appliance will benefit the solar panel manufacturing organization because of the capabilities this virtual appliance brings. When using databases to house sensitive data, they need the optimal amount of security to protect the database from external

threats. The Percona Server virtual appliance has capabilities for extended encryption methods and authentication features. This capability will increase the security of the database and further protect it from external threats from threat actors.

## High Availability

High availability ensures that all systems and applications remain available and functioning as expected. It's crucial that availability of virtual machines remain high so that operations are maintained and downtimes are limited. Downtimes can cost organizations thousands of dollars depending on how long systems are down. In a virtual environment, downtimes are more forgiving because of how fast it is to deploy another virtual machine. However, it is still paramount that downtimes are reduced and high availability is achieved. Cloning virtual machines and using templates will ensure that any virtual machine that is unexpectedly taken down can be immediately replaced by the clone or a new one is created using a template. Failover clustering will also maintain high availability. VMWare vSphere has a capability to maintain high availability by creating failover clusters. Failover clusters are secondary components that assume the role of the primary component when the primary component is taken offline unexpectedly. During a server failure due to a system crash, power

interruption, or network failure, vSphere detects which VMs have been taken offline and restarts them using the failover clusters. Load balancing was discussed earlier but it is another method to achieve high availability. To prevent VMs from shutting down due to overuse, the workloads of the VMs have to balanced out with each other. Load balancing is the efficient distribution of network traffic across a group of virtual machines. It distributes network traffic in a way that maximizes speed, capacity utilization, and ensuring that no one VM is overworked. Overworked VMs will have degraded performance and may shut down. If a VM shuts down for another reason, the load balancer will redirect the traffic from the offline VM to online VMs and balance the workload.

## Virtualization Transition Challenges

When transitioning from a physical infrastructure to a virtual infrastructure, there are going to be challenges. Confronting these challenges is important for an efficient and effective transition. Since virtualization is going to be a relatively new concept for most employees in the organization, there will be an increased amount of technical support required. Many employees will be asking questions about certain functions that they have not worked with before and how to use that function. To solve this challenge, a quick-start guide can be created for new employees

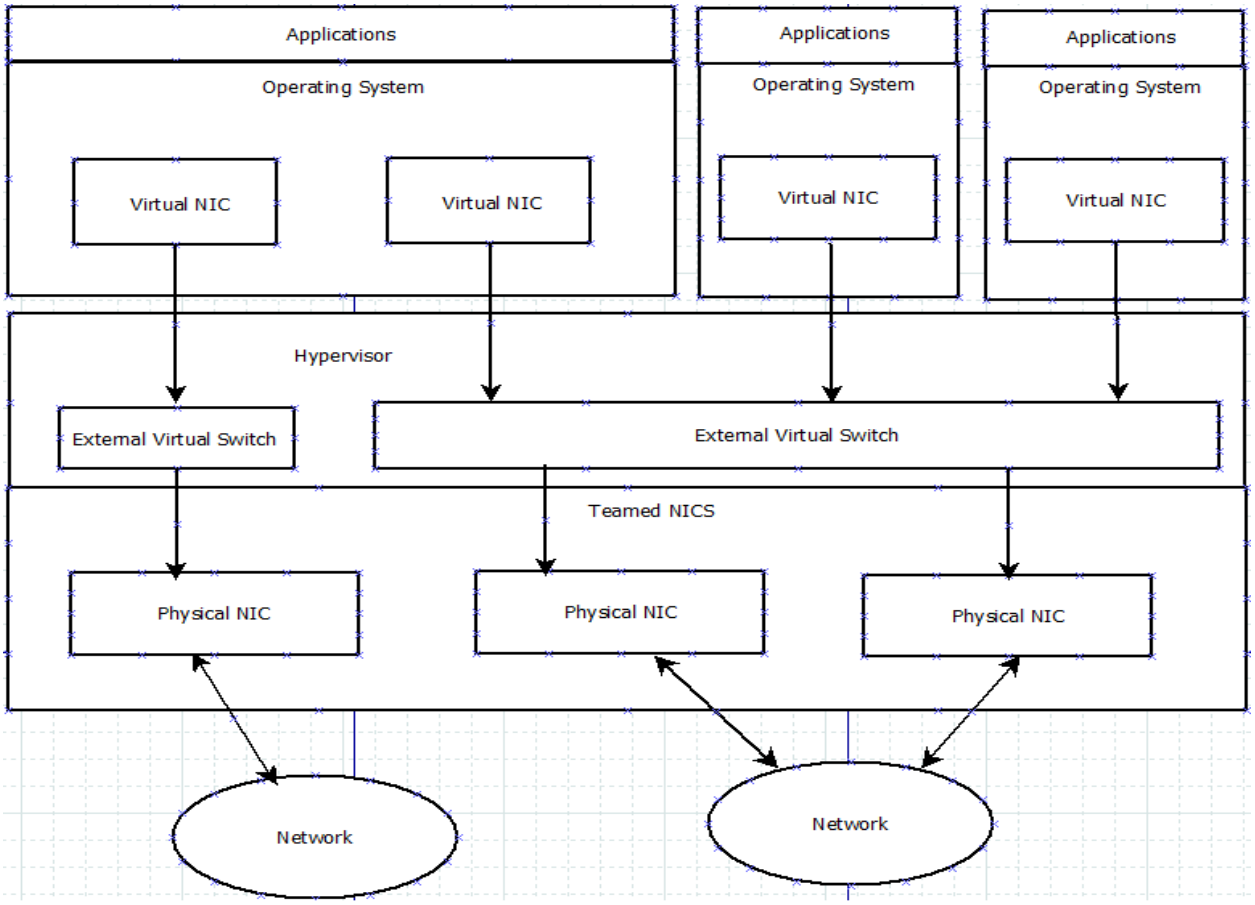
to look at. A troubleshooting guide can also be created as new issues occur with the virtual infrastructure so that employees have the opportunity to solve the issue themselves.

Another challenge is figuring out which virtual platform is right for the organization. Since this is the first time the solar panel manufacturing organization is transitioning to a virtual infrastructure, it will be hard to determine which platform is right for them. To determine which platform is right for the organization, there will need to be an understanding of the organization's requirements and needs; mainly, what they are trying to achieve, what the goals are, and what kind of tools are needed to achieve those goals. Some other factors to consider when choosing a platform is the cost, ease of use, features, and customer support.

Security and compliance are also challenged when implementing a virtual infrastructure. Since it is different from a physical infrastructure, there will be new security protocols being added. As these new security protocols are added, organizations must ensure that all employees comply with these new standards to prevent a security breach. Monitoring software can be installed that will provide insights into the security of systems and flag any anomalous actions immediately.

When implementing a different kind of infrastructure, there may be some reliability issues. These issues can be hard to track down because they can stem from anywhere in the infrastructure. Since the people managing this infrastructure are inexperienced, it can be hard to pinpoint the root cause of the issue. A unified platform can be used to combine data across multiple functions within the virtual infrastructure in order to quickly find reliability issues before they affect the infrastructure.

**Virtual Infrastructure Design**



The proposed virtual infrastructure design is one that ensure high availability by utilizing Network Interface Card (NIC) teaming. NIC teaming bundles two or more physical NICs into a group and allows traffic to be balanced across all devices (uCertify, 2011). If one NIC were to fail, the load will be balanced with other available NICs. The three boxes on the top are the virtual machines that house the applications such as the web servers, database servers, and application servers. The virtual NICs in those VMs are connected to external virtual switches within the hypervisor. The switches in the hypervisor are connected to the physical NICs within the physical server housing the virtual infrastructure. Those physical NICs are then connected to the networks. Since there are an abundant amount of servers needed, more than one physical server with this design will be needed.

## Conclusion

With this virtual infrastructure plan, the solar panel manufacturing company will be able to make a successful transition from a physical infrastructure to a virtual infrastructure. With the amount of application, database, and web servers needed, a virtual infrastructure will provide the required hardware resources for those servers and without any cooling issues that are present in a physical infrastructure.

## References

uCertify. (2011). *Ucertify Guide for Cisco Exam 640-553: Iins*.