Automating the
Virtual Data Center

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If your company is like most organizations, virtualization has become a fact of life in your data center. And it is transforming many aspects of the data center – resulting in better system utilization, application availability and cost savings in hardware and energy use. For these reasons and others, virtualization technologies are being deployed to drive the efficiency and effectiveness of data center resources.

While virtualization tops most lists of priorities for enterprises in 2010, the technology also presents challenges in terms of managing a dynamic environment. One of the greatest obstacles of virtualization is the assignment and allocation of appropriate network resources as virtual machines, or VMs, are provisioned amongst diverse network locations. Virtualizing a single data center introduces a number of challenges – not the least of which necessitates moves, adds and changes of virtual images – which adds network provisioning complexity and impacts IT administration workload.

According to a January 2010 Gartner report “Virtualization is Bringing Together Configuration and Performance Management” (ID Number: G0017236), there are several issues with today’s virtual data center environment that need to be addressed before widespread adoption takes place:

- Virtual Machine (VM) sprawl remains a continuing challenge that is a critical contributor to the continued execution of many underutilized VMs, or VMs that are not compliant with operational or runtime policies.

- Over-provisioning with limited policies has led many IT organizations to fail to achieve VM image consistency, which impacts operational consistency, including automation activities and normalizing resource configuration standards.

- Owners of mission-critical applications have often been reluctant to move key services to the virtual world, due to an inability to translate their workload requirements into VM profile settings.

- Few, if any, virtual deployments connect configuration and performance to determine rightsizing and performance for virtual servers.

All of these issues point to the need for automation, visibility and mobility as key requirements when selecting a vendor for the data center network. Ideally, a solution will meet the needs of today’s data centers and tomorrow’s cloud architectures to provide support for multi-vendor storage, virtualization software and server environments, focusing on standards and open architectures to ensure optimum performance and availability of business applications.

**Bridging the Divide Between the Physical and Virtual Worlds**

Data centers must achieve scale to derive the maximum benefits for the business. The integration of virtualization system management tools with traditional network management tools is not fully mature. Today, many enterprises integrate the virtual and physical network via proprietary SOA-based interfaces. However, this area is likely to experience standardization over the next two years.

Today’s data center solution needs to create cross functional transparency by bridging the divide between virtual machines and network provisioning applications. Servers and network management applications have historically operated as sepa-
rate islands in the data center. However, the move to virtualization technologies is driving IT organizations to bridge the gap between these applications. The ideal data center solution should provide an integrated view of virtual server and network environments, providing IT administrators with a transparent cross-functional service provisioning process.

In this way, when network configurations are made, communication between the network and vSwitch, or virtual switch, is greatly improved. Each group has insight across the entire data center – servers, storage and networks. When the networking team makes a change, such as setting the QoS for an application, that change is automatically propagated across the corresponding VM. This cuts down on the manual steps needed when, for example, the server team puts in a request to the networking team for provisioning a new server. Instead of the server team needing to issue a ticket and wait for a response from the network group, the change can be automatically applied to the network.

Ideally, the data center networking solution requires no special software or application loaded onto servers and virtual machines. The solution interfaces directly with the native operating systems and server and VM visibility and control are provided with no bias to the server or operating system vendor. With this setup, customers have the freedom to choose the server vendor that best fits their requirements, not the vendor that will lock them into a one stop shop solution.

One key aspect to managing today’s virtualized environment is the automatic application of individual and unique policies to various data objects in the switching fabric, including mobile VM sessions, users, applications and iSCSI traffic. This includes prioritization, QoS settings, bandwidth allocation and security and is applied as soon as the traffic enters the data center switching fabric. The crucial aspect is the ability to establish network profiles for physical and virtual machines and distribute them...
within the network fabric, as well as coordinate the profile assignment of virtual machines to ensure consistent delivery of services regardless of the physical location of the VM.

Scaling Your Data Center for VM Disaster Recovery

Virtualization of computing resources in the data center has yielded significant operational efficiency gains for IT administrators. However, it has also brought several challenges along with it. Consider how scenarios such as VM disaster recovery planning and associated network provisioning can cause IT management headaches.

Realizing the full promise of dynamic re-provisioning and disaster recovery flexibility offered by today's virtualization solutions requires a network infrastructure that will dynamically adapt without human intervention. Intelligent infrastructure automation can solve three key network automation challenges in a virtualized data center without sacrificing access controls, prioritization, or compliance controls recognized in static data center environments. These network automation challenges include:

1. Automated virtual machine identification and authentication
2. Automated virtual network provisioning
3. Differentiated access provisioning on shared network interface(s)

The first element of an automated virtual data center solution is authentication. Implementing machine authentication, also known as MAC authorization or MAC bypass, allows the infrastructure to recognize a new forwarding station on an Ethernet port. This intelligence provides insight into the device, capturing necessary requirements. The second requirement is to ensure the virtual data center is automated for appropriate network resource allocation and provisioning. The provisioning instructions provided should include the VLAN assignment for the virtual machine, any necessary access control lists (ACLs), and appropriate quality of service (QoS) assignments for application priority delivery. The third key required element is the ability to provide differentiated access provisioning for the multiple virtual machines sharing a single gigabit or 10 gigabit Ethernet interface.

The implementation of an integrated network and VM management system allows the IT administrator to group virtual machines into supporting business roles. This ensures that as a virtual machine is provisioned, or re-provisioned, that it receives the correct services it requires. Smarter integrated physical and virtual management systems can coordinate multiple resources, solving the challenge of virtual machine mobility.

Consider the following example: a customer wants to ensure that if his location in Orlando experiences a partial server outage, that the virtual machines that the business is dependent on can be re-hosted at his data center in Tampa. His challenge: the IP address of the virtual machines hosting critical manufacturing applications must not change. As the hypervisor management system re-hosts the virtual machine, the network access request from the switch in Tampa matches a location policy in the integrated network and VM.
management system. The switch port is provisioned with the correct VLAN, ACLs and QoS settings as it would normally occur, but an additional action provisions the local router to advertise the IP address of the migrated virtual machine at the Tampa facility. The remaining IP address range is still located in Orlando and connectivity is maintained. When the Orlando data center has the capacity to host the virtual machine, the migration is reversed.

This scenario would normally require the coordination of several IT administrators, along with extensive communication and manual intervention. The human aspect introduces timing issues and the potential for configuration errors. Automating this process provides for a quick and consistent recovery of the business application that is predictable, repeatable and is not dependent on the presence of a human operator.

This type of automation can solve many challenges, and it is for this reason that it’s critical the data center infrastructure has the core capabilities required to execute precise and dynamic network provisioning.

**Conclusion**

The data center plays a key role in supporting business applications and an increasingly mobile workforce. With the trend toward consolidation via virtualization and cloud computing, the need for automation and visibility is more important than ever before to keep up with the increasing desire for faster access to data.

Regardless of the organization’s reasons, dynamic allocation and location of virtual services will drive an increase in the adoption of technologies to enable the mobility of servers across geo-boundaries. This will also require the provisioning of data center services across multiple data centers – including across the corporate (private cloud) and public cloud.

In order to maintain data center efficiencies, while making the best use of new virtualization technologies, data center solutions should combine comprehensive centralized management with high availability services to ensure enterprise employees have secure and easy access to the critical applications housed in the data center network.
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