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DEFINING MOMENT: THE SOFTWARE-DEFINED DATA CENTER

The virtualization tide promises to lift all boats by changing siloed data center operations into an automated and orchestrated pool of computing, storage and network resources.

Executive Summary

Server virtualization has greatly improved data center operations, providing significant gains in performance, efficiency and cost-effectiveness by enabling IT departments to consolidate and pool computing resources. Many organizations are now looking to take this strategy further.

By extending virtualization concepts to network and storage resources, and employing an abstraction layer to bring intelligent, centralized management over the entire data center infrastructure, organizations hope to transform their data centers from delicate and deeply siloed operations defined by hardware components to highly automated and effectively orchestrated resources designed around software. To leverage these capabilities, enterprises must adopt a strategy to become 100 percent virtualized.

The benefits of a software-defined data center (SDDC) are many. Pooled server, storage and network hardware reduces the need for specialized components and servers in favor of affordable, off-the-shelf hardware that is easier to maintain.

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Most important, the SDDC enables automated, policy-driven provisioning and management of data center resources. Program interfaces make it possible for applications to request resources based on clearly defined rules and policies. The result: A more responsive, agile, secure and high-performing data center that takes full advantage of the underlying hardware.

Event Horizon: SDDC

Over the past decade, IT teams have experienced firsthand a revolution as desktop and server virtualization redefined the deployment, management and optimization of computing resources, both inside and outside the data center. Application loads that once ran on static, dedicated servers are today hosted in dynamic, virtualized server environments that can be scaled and shaped to meet demand. Resource allocation requests that took weeks or even months to fulfill now can be accomplished in hours or even minutes.

Virtualization has reshaped data center operations, enabling enterprises to deploy affordable, rack-based servers that can be pooled and allocated to shifting application demand. But the transformation is incomplete.

Network and storage assets in the data center remain tightly siloed and statically managed. Few facilities are capable of automating and orchestrating the management of pooled network and storage hardware. An organization that deploys storage solutions from different vendors must manage them discretely. Network provisioning and management is similarly tethered to hardware.

The software-defined data center promises to change that. Building on the model applied to servers, SDDC proposes to virtualize network and storage resources to enable an abstracted data center infrastructure that can be managed and accessed by software and applications.

VMware describes the SDDC as "a unified data center platform that provides unprecedented automation, flexibility, and efficiency to transform the way you deliver IT. Compute, storage, networking, security, and availability services are pooled, aggregated, and delivered as software, and managed by intelligent, policy-driven software."

Ultimately, the SDDC eliminates the need for IT technicians to manipulate siloed server, network and storage hardware in response to a provisioning request. Rather, provisioning takes place automatically within the framework of defined rules, policies and service-level agreements, passed via application programming interface (API) calls to the automation and orchestration engine that configures the appropriate resources from a pooled environment.

The SDDC vision is expected to produce a large and growing market in the near future. A 2013 report, from research firm MarketsandMarkets, projects that SDDC sales will grow from $396.1 million in 2013 to $5.41 billion by 2018.

How It Works

The SDDC comprises three operational siloes: server/computing, storage and networking. Layered atop these systems is an abstraction layer that presents the discrete, underlying hardware as a unified pool of available resources, enabling programmatic access to the capabilities within. Each of these siloes is powered by a foundational technology, each a variation of virtualization.

Server Virtualization

Server virtualization is a mature and widely adopted technology served by multiple, proven hypervisor products, including those from leading vendors such as Citrix, Microsoft and VMware.

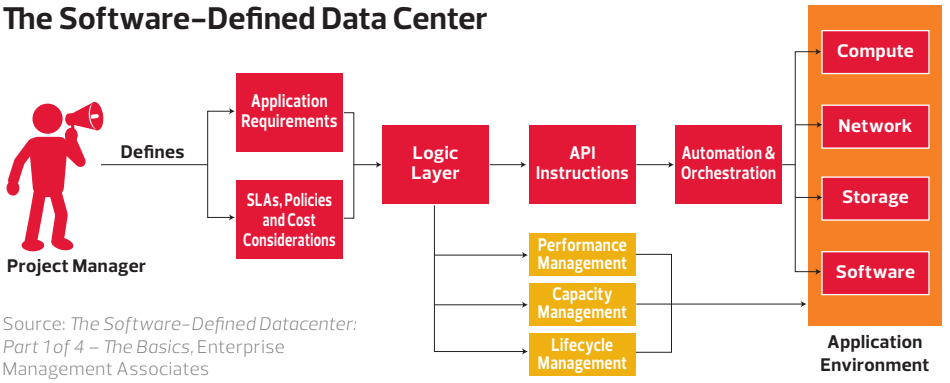
A ZK Research survey in 2013 found that server virtualization has emerged as the dominant computing model among enterprises. About 52 percent of respondents reported that more than half of their workloads in 2013 were virtualized, up from just 18 percent in 2008.

Storage Virtualization

Storage virtualization, or software-defined storage (SDS), applies the same hardware abstraction concepts that drive server virtualization to the arena of distributed storage. The goal is to enable unified, software-based control and management of disparate storage hardware, while enabling key functions such as snapshot, cloning, data recovery, backup and deduplication.

By abstracting storage silos based on storage area networks (SANs), network-attached storage (NAS) and other technologies, SDS presents a pooled storage infrastructure that administrators' applications access via API calls.

The Software-Defined Data Center



Source: *The Software-Defined Datacenter: Part 1 of 4 – The Basics*, Enterprise Management Associates

Importantly, these APIs will enable applications to specify provisioning requirements for performance, data protection and other characteristics, so the SDS infrastructure can provide the appropriate blend of storage hardware to each task.

Key SDS players include leading storage vendors such as EMC, Hitachi, HP, IBM and NetApp — many of which offer virtualization and management software for their hardware solutions.

Network Virtualization

Network virtualization, also called software-defined networking (SDN), is arguably the least advanced of the three foundational components. However, according to the 2013 MarketsandMarkets report, the SDN market is expected to grow from just $198 million in 2012 to $2.1 billion in 2017.

Industry standards promise to improve interoperability and enable software-based control and orchestration of network infrastructures. The open-source OpenFlow protocol provides an agreed-upon way to enable a centralized, programmable network, with APIs for managing network traffic and enabling network-aware applications.

Virtual LAN overlay standards, such as Virtual Extensible LAN (VXLAN), Network Virtualization using Generic Routing Encapsulation (NVGRE) and Stateless Transport Tunneling (STT), enable transmission of packets over virtual networks laid atop the physical network hardware. Industry experts caution that progress toward a fully abstracted network layer may be slowed by overlapping standards efforts and the vested interests of leading hardware incumbents.

Critical to SDN development is the OpenStack suite of industry standards, most notably the OpenStack Neutron (formerly Quantum) project, an API-based software system that provides extended control over software-defined networks and enables SDN controllers to interact with higher-level orchestration systems. OpenStack Neutron enjoys broad industry support.

Sophisticated management software and intervening layers of logic serve to present pooled and virtualized data center hardware as a cohesive, unified resource offering orchestration and automation. The OpenStack project provides open APIs for computing, networking, storage, security and management components. The system enables orchestration of diverse hardware environments, providing infrastructure as a service (IaaS) to organizations seeking to create private clouds.

Value Proposition

IT departments are still waiting for the SDDC to reach its true potential, as the industry awaits adoption of mature industry standards and compliant vendor hardware. Nonetheless, the potential benefits of the SDDC are both numerous and profound. They include the following:

Streamlined provisioning: The SDDC allows IT shops to quickly and effectively provision computing, storage and network resources from a central interface, eliminating the need to work with siloed storage and network device interfaces and hardware. Ultimately, the intelligent abstraction of hardware in the SDDC enables provisioning of resources through policy-based automation, while ensuring that performance, security and compliance requirements are met.

Resolved network bottlenecks: Network management remains a pain point in the data center, producing long response times when additional resources are needed. In an SDDC, all network hardware in the data center is responsive to a central authority, which automates network provisioning based on defined policies and rules. Pooled network resources can be automatically applied to relieve bottlenecks and ensure application responsiveness.

Unified management: The SDDC enables centralized monitoring and management of all data center resources, enabling IT administrators to allocate pooled resources from a single point of control. Admins no longer need to work with multiple, vendor-specific configuration interfaces.

Improved security: Policy-based management ensures compliance with security policies and mandates, and eliminates errors common to repetitive, manual processes. Unified monitoring of data center resources provides a global perspective on data resources and eliminates the piecemeal monitoring of resources across operative silos and vendor products.

Lower power consumption: Server virtualization has already yielded more efficient data centers, as ranks of underutilized, dedicated servers are folded into pools that can be freely allocated to meet demand. The strategy of running fewer systems at higher utilization has helped reduce power and cooling costs at many data centers, and the SDDC promises to extend this benefit to storage and network hardware.

Enable private clouds: Broad support for the OpenStack infrastructure-as-a-service (IaaS) standard is providing an attractive target for both vendors and organizations seeking to enable dynamic and scalable management of workloads in the data center and across the cloud. According to the 2014 Enterprise Management Associates survey, about half of respondents plan to deploy OpenStack by the end of 2014.

Preparing for the SDDC

The software-defined data center is not for every enterprise. Smaller organizations may find that the cost, effort and risk inherent in migrating aggressively to an SDDC is not worth the eventual return on investment in improved responsiveness, enhanced control and reduced ongoing expense.

Even as organizations begin to deploy solutions, the software-defined data center remains very much a vision. Server virtualization is mature, but software-defined storage and

networking both are still in their formative stages. Enterprises that aim to move to an SDDC face a years-long process as they acquire skill sets, redirect hardware acquisitions and adapt business and IT processes.

What follows are necessary steps that IT teams should take to better position themselves for transition to an SDDC.

1. Prepare the infrastructure by virtualizing all aspects of data center operations. Once the server, storage and network infrastructures are virtualized and pooled, the data center becomes eligible for policy-based provisioning.

2. Standardize. Adopt the standard of one when it comes to the infrastructure: one network vendor, one storage vendor, one server vendor, one hypervisor, etc. This approach will result in lower cost to service and better position the organization to take advantage of automation/orchestration solutions that are emerging.

3. Acquire and develop the skills on staff to effectively deploy, manage and master next-generation SDDC solutions. Place a premium on expertise in the areas of systems automation and orchestration. Explore vendor-provided consulting and service offerings that can augment on-staff expertise.

4. Create an organizationwide automation and orchestration strategy. Moving to an SDDC mandates the adoption of automation and orchestration at a strategic level. Get ahead of the process and start assessing available products and tools, and commit to training staff. Ensure that mission-critical policy and compliance issues, including those around information security, are fully accounted for in the plan.

5. Select a solution for policy-based infrastructure provisioning and for continuous and policy-driven capacity planning.

6. Start thinking about a strategy to adopt open standards. Carefully track the progress of standards such as OpenStack and OpenFlow, and confer with vendor partners on their approach to these standards.

7. Carefully assess and adjust software and hardware acquisitions to align with organizational goals. Implement guidelines based on product management APIs and consider vendor support for standards.

8. Transitioning to an SDDC requires a change that goes beyond simply adapting technology and processes, and extends to the culture and structure of the organization.

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