Managing VMware Best Practices by Mapping Dependencies across Physical and Virtual Environments

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Executive Summary

Enterprise Management Associates (EMA) defines virtualization as: “a technique for abstracting the physical characteristics of computing resources from the way in which other systems, applications, or end users interact with those resources.” With benefits including dramatic cost savings and improved capital efficiency, faster delivery of new products and services, and greater business continuity for critical services, it should be no surprise that the adoption rates for virtualization are high. For example, according to EMA research, server and OS virtualization is growing at about 20% per year.

At the same time, in order to realize the benefits, some significant management challenges must be addressed. This EMA white paper discusses traditional challenges involved in managing VMware based virtual environments as well as emerging issues based on rapid change from capabilities like VMware’s VMotion and Dynamic Resource Scheduler. EMC Application Discovery Manager 6.0 and EMC IT Compliance Analyzer – Application Edition 1.1 are discussed along with their unique advantages.

The Management Challenges of Virtualization

The ease of VM deployment means that without some form of governance or control, large numbers of unapproved VMs can quickly be created and result in VM sprawl. Without appropriate compliance processes, new VMs can use copies of software licenses that are already in use. Without adequate management processes and tools, virtual systems can quickly become unauthorized backdoors to the entire enterprise IT environment if, for example, IT fails to apply a new version or patch level to installed software. With VM sprawl, it is difficult to control each of these details across all VMs.

The complexity of applications, even in a strictly physical world, has been increasing for many years – decades really. Multi-tier applications with interdependent components running across several servers, receiving load balanced requests, and subject to peaks and valleys of user demand have become the norm. Application dependency mapping technologies have entered the scene and give far greater visibility to the various distributed application components and their relationships with infrastructure components including servers, network and storage.

Some of these tools have even recently been expanded to understand the intricacies of applications running in fully or partially virtualized environments. This is a key requirement to ensure a single set of tools and processes can be utilized for both physical and virtual resources. However, while management tools have been improving and adapting to the virtualized world, yet another valuable and powerful technology has been emerging. VMware’s VMotion capability enables fast, automated, transparent migration of guest VMs between servers, whether physical servers or VMware ESX servers. VMware’s Dynamic Resource Scheduler takes advantage of this capability to support prioritization of applications and take advantage of less utilized server resources. This capability further improves server utilization and better meets the needs of the business. At the same time it adds an unprecedented level of change.
Greater Challenges Are Emerging

The virtualized infrastructure is now not only more complex than the physical infrastructure, it changes more quickly. The implications for this go beyond individual systems and VMs, and may profoundly impact the performance, availability and quality of the multi-tier applications they host. To troubleshoot application issues a current understanding of dependencies is needed. This includes, among other information, which servers are running the various application components, which other applications are competing for resources on shared infrastructure, and the network paths utilized between application components and application users. But *current* does not mean a snapshot of the application dependency map from yesterday or even from five minutes ago. It means a continuously updated view of application dependencies across physical and virtual environments where VMotion and DRS may be frequently altering dependencies.

Maintaining performance, availability and quality goals for applications are not the only more difficult challenges for virtualized environments. The IT organization is responsible for ensuring compliance with external regulations and internal policies. However, applications may run on a changing set of servers, each now required to be compliant. Best practices suggest that a limited number of VMs should run on a given server. At the same time, the attributes and values used to calculate this number are changing as the mix of workloads changes. Application management teams must ensure the applications they support have appropriate disaster recovery plans. Yet the application recovery process changes every time application dependencies change.

Mixed Environments Require a New Management Approach

It is clear that application dependency mapping provides the visibility needed to understand dependencies throughout the infrastructure. And it is clear that this visibility is essential for basic operations including troubleshooting application problems, ensuring performance targets are maintained, monitoring compliance, understanding the impacts of proposed changes, and others. But dependency mapping in rapidly changing environments of physical and virtual assets requires change to be detected as it occurs.

Maintaining current application dependency maps requires awareness of the continuously changing relationships between the application itself and the infrastructure fabric that supports it. Yet many application dependency mapping technologies still don’t even understand, discover and maintain the highly nuanced dependencies within virtual environments. And, importantly, most solutions lack the ability to detect and map dependencies between physical and virtual environments.
Managing VMware Best Practices by Mapping Dependencies across Physical and Virtual Environments

Managing Mixed Physical and Virtual Environments

Two EMC products can be used to address an impressive list of management challenges across physical and virtual environments.

EMC Application Discovery Manager 6.0

EMC Application Discovery Manager (ADM) is an industry leader in application dependency mapping with distinctive real-time capabilities that enable continuous application dependency mapping. Packaged as an appliance, ADM’s agentless auto-discovery leverages a variety of techniques including passive listening and deep packet analysis to discover and map relationships and capture changes as they occur. Once installed, it continuously discovers applications, servers, routers and switches to maintain a real-time view of application usage and demand, relationships, dependencies and changes across the physical and VMware application infrastructure. For example, an n-tier application may utilize a mix of physical and VMware servers. ADM can discover the dependencies across the entire application, including those where an application component running on a physical server depends on an application component running on a VMware server and vice versa.

This is complemented by policy-driven active discovery capabilities that can be programmed to occur at specified intervals, or on request. ADM’s active discovery leverages SNMP, telnet, SSH, and WMI protocols to collect detailed information on servers and applications, and allows IT professionals to selectively examine specific configuration items (CIs) to ascertain in depth CI information. By allowing users to selectively scan CI data while passively maintaining a real-time view of the IT environment, ADM streamlines the performance load and presents the detailed view in real-time context.

This brief outline of capabilities is sufficient to introduce the key management scenarios where EMC ADM 6.0 is instrumental in streamlining the management of virtual environments. Additionally, other white papers provide more background on the depth and breadth of ADM 6.0’s management capabilities (see “EMC’s Acquisition of nLayers: Value-add or Transformer?” EMA, June, 2006 and “Managing Virtualized Environments in Application Context with EMC Application Discovery Manager v6.0.” EMA, May, 2008). These include the ability to adjust and control the depth of discovery, minimal configuration, fast time to value, more than 500 application “Fingerprints” for identifying common commercial applications, simple GUI to define and add their own application patterns for accurate identification of n-tier and custom business applications, tracking historical changes, notifying when elements change, and many others.
EMC IT Compliance Analyzer – Application Edition v1.1

The IT Compliance Analyzer – Application Edition v1.1, offers support for automated, user defined, policy-based analysis of compliance, governance and best practices initiatives. It can help assess and maintain compliance with industry and government initiatives such as Sarbanes-Oxley, PCI DSS (Payment Card Industry Data Security Standard) and HIPAA. It can also support internal initiatives for IT governance and best practices, such as ITIL, by applying user-defined policies across the application fabric by leveraging the data provided by ADM. As such, IT Compliance Analyzer identifies configuration violations by validating application-related configurations, changes and dependencies. IT Compliance Analyzer comes with pre-configured policy templates, such as PCI and VMware best practices, while its GUI-based “policy builder” allows for custom policy creation. This ability to audit to meet governance and compliance standards in real time answers one of the generally unmet requirements in the industry for virtualized environments.

Key Management Scenarios for VMware Environments

EMC ADM and IT Compliance Analyzer work together to support both basic and difficult management issues within mixed physical and virtual environments.

Managing Ongoing Operations

- ADM’s real-time, “continuous listening” capabilities independent of scanning cycles or polling make it a natural fit for the real-time and unpredictable dependency changes within VMware environments, especially where VMware VMotion or DRS are used. These capabilities can support initiatives such as data center consolidation by ensuring that applications remain optimized during periods of transition.

- The nature of moving VMs when using VMotion or DRS creates a potential problem in shifting dependencies when VMs are moved from one server to another. ADM can tell whether application dependencies will be maintained before, during, and after moving apps from one virtual server to another (for maintenance, for resource, and for load balancing, etc.) to help ensure that business services are not disrupted.

- ADM can help to control the configuration consistencies of physical and virtual environments – including configuration drift – making sure that as virtual servers are built and destroyed, applications remain operational during start and stop.

Gaining End-to-End Perspective and Control

- ADM’s visibility into the volume of application flows over the network will help it to validate that normal performance patterns are sustained, while helping to optimize VMware resources by discovering where systems resources may be underutilized.

- ADM’s application flow monitoring also helps to detect chatty applications and other applications that may saturate I/O resources, and so may not be suitable to virtualized environments.
Looking at applications usage and dependencies from end to end helps determine optimal configuration settings for ESX servers or even improve resource utilization by identifying VMs that are no longer in use.

**Ensuring Compliance**

- In conjunction with ADM, IT Compliance Analyzer can help ensure compliance with VM implementation strategies, operational best practices, security policies, and regulatory requirements such as Sarbanes-Oxley, PCI DSS, and HIPAA. This is a much-needed advantage given that support for governance and compliance is drastically underserved in the current market.
- IT Compliance Analyzer can make sure that applications aren’t running in the wrong locations, such as a Virtual Machine being vMotion-ed to an insecure zone, or a data center-only application running in an unauthorized field office.
- Before a major application rollout, the solution can check that servers are configured correctly with respect to minimum hardware requirements and use of correct OS versions, drivers, patches and utilities. It can even find rogue VMware ESX Servers that are not currently managed by Virtual Center.
- ADM can be used with IT Compliance analyzer to ensure that applications are communicating correctly with respect to crossing the right security zones, communicating only to clients in authorized groups, using secure protocols, etc.
- In addition, users can easily make sure that applications are configured for high availability and performance, such as having multiple servers available for critical applications, a minimum number of service instances (e.g. databases) in a business application, and that they are using high performance hardware.
- Finally, ADM and IT Compliance Analyzer can ensure that the application environment is continuously up to date, including application versions, OS versions, virtualization platforms, and patch, driver, and utility versions. For example, it can check that the appropriate version of VMware tools is installed and running.

**Planning for Disaster Recovery**

- When VMware Site Recovery Manager is used with ADM, disaster recovery plans can become more accurate and reliable. For example, ADM plugs into the VirtualCenter database and listens to “network” traffic inside ESX to capture flows – and therefore additional dependencies – between VMs running on the same ESX server.
- ADM identifies other subtle or hard to find dependencies found in complex virtualized application environments. For instance, if a VM is moved from a replicated to a non-replicated storage container, ADM can detect this so it can be addressed in the disaster recovery plan.
- ADM helps keep disaster recovery plans up to date by tracking new VMs and changing dependency hierarchies which often impact the timing and sequence of recovery procedures.
- In the case of DRS, ADM can help determine if VMs are moving too often.
VMware Optimization

- For those getting started with VMware, ADM accurately maps the dependencies of VMs and their application components that are running on a single server to application environments. More specifically, it maps out physical-to-physical, physical-to-virtual, and virtual-to-virtual interdependencies in application context.

- ADM can also support pre-deployment planning for new VMware environments by mapping application dependencies to targeted resources with insights into how to optimize virtual machine configurations.

- ADM can take snapshots of applications moving from physical servers to VMs to help IT planners assess and rationalize systems resources and their dependencies. Then ADM can help to manage the migration to VMware by analyzing how VMware is positively or negatively impacting applications through its continuous discovery and tracking of application dependencies and configuration changes across physical and virtual environments.

- By nature, VMware best practices documents do not have mechanisms to ensure the best practices are actually followed. Using these tools adds methods for both detecting and mitigating deviations from best practices.

- Additionally, IT Compliance Analyzer supports best practice rules like number of ESX servers per VirtualCenter, number of VMs per processor core, and number of network interfaces per VM.

EMA Perspective

Application management in virtual environments has many challenges. To meet end-user and business expectations, robust application management strategies must include processes and tools for performance, availability, quality, disaster recovery, compliance, and best practices management. Tools that span both physical and virtual servers are a critical part of basic operations. At the same time, they must keep up with rapid changes. Application dependency mapping, like that found in EMC ADM 6.0, is the recommended approach.

While there are alternative approaches to application dependency mapping, the EMC ADM approach of real-time, passive listening allows detection of changes as they happen. This is the heart of a continuous approach to application dependency mapping and is important for all types of rapidly changing environments, whether virtual, physical or mixed. Regardless of whether a change is one week old or only one hour out of date, it is still a change that could impact application availability, performance, disaster recovery or others. Therefore it is critical to maintain up to the moment application dependencies.

Given growing industry recognition that virtualization goes beyond server resources, EMA expects EMC to explore even more options in the future that will further expand the value of management tools in multi-technology virtual environments. For now, ADM and IT Compliance Analyzer provide a unique and leading solution with key advantages for addressing complex, changing environments – particularly those based on VMware.
About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst and consulting firm dedicated to the IT management market. The firm provides IT vendors and enterprise IT professionals with objective insight into the real-world business value of long-established and emerging technologies, ranging from security, storage and IT Service Management (ITSM) to the Configuration Management Database (CMDB), virtualization and service-oriented architecture (SOA). Even with its rapid growth, EMA has never lost sight of the client, and continues to offer personalized support and convenient access to its analysts. For more information on the firm's extensive library of IT management research, free online IT Management Solutions Center and IT consulting offerings, visit www.enterprisemanagement.com.

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