

## Virtualization Management (VMAN): A Building Block for Cloud Interoperability

### DMTF Standards enabling Cloud Computing

#### Introduction

Cloud computing is now a reality and virtualization is a key technology used to create computing clouds. This has increased the need for standards that will help enable the interoperability of this new paradigm. Customers want to take advantage of the flexibility and reduced cost that cloud computing offers but are concerned about getting locked into one vendor's cloud.

Virtualization allows IT managers to increase use of their existing physical resources and even reduce the number of systems deployed and managed. This consolidation helps reduce hardware management requirements, mitigates power and cooling needs, and thus lowers IT costs overall.

However, while system virtualization can reduce the cost of owning and maintaining physical hardware, some of the savings is offset by the added systems management complexity introduced by virtualization. Instead of managing numerous physical servers, administrators are managing many virtual computer systems (i.e. virtual machines) consolidated onto fewer physical servers. The management complexity has just shifted from hardware to virtual computer systems.

Cloud computing has been described using three key categories; Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). The management standards developed within DMTF deal predominantly with the later and help manage clouds that provide infrastructure as a service.

#### Management of Cloud Computing Systems

The Distributed Management Task Force (DMTF) has introduced management standards to address the complexity

of managing a virtualized environment that can now be used to help manage new cloud computing environments. DMTF is the leading industry organization developing standards for systems management and promoting interoperability of solutions using these standards. The following diagram (Figure 1) outlines various management domains and the various levels of cloud computing models. DMTF standards are focused on the bottom most layer to provide manageability of the infrastructure layer. DMTF VMAN standards address packaging/distribution, deployment/installation and management of Cloud IaaS that rely on virtualized systems.

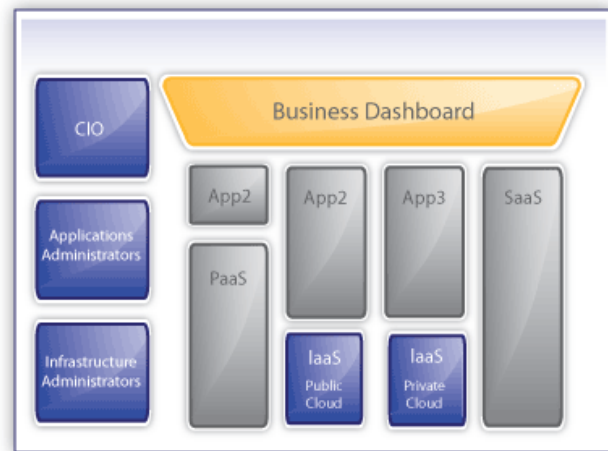


Figure 1. Cloud Computing Management Domains

#### Open Virtualization Format (OVF)

OVF is a DMTF standard for *packaging* and *distributing* virtual appliances. A *Virtual Appliance* is a pre-built software solution, comprised of one or more virtual machines that are packaged, maintained, updated and managed as a unit. OVF enables portability and simplifies *installation* and *deployment* of virtual appliances across multiple virtualization platforms. For more information about OVF, please refer to **OVF Tech Note:** [www.dmtf.org/ovf](http://www.dmtf.org/ovf)

Virtual machines described using OVF enables the portability of applications and services in a well defined container for describing and deploying one or more virtual machines. Figure 2 illustrates the use of OVF as a packaging

format for moving virtual machines to be deployed in clouds whether they are public or private clouds.

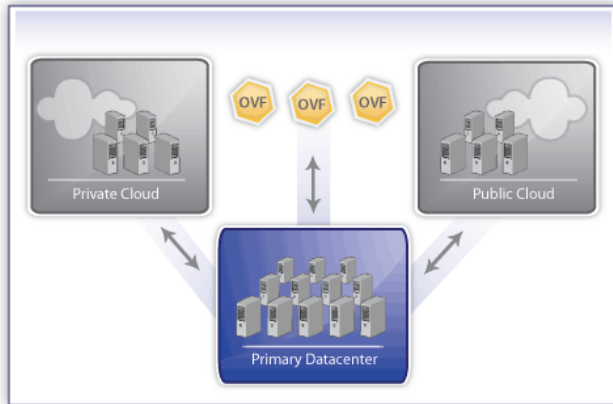


Figure 2. Public, Private and Hybrid Cloud Interoperability

## System Virtualization Management

Standards developed by DMTF for system virtualization management define a consistent way for *managing* any virtualized environment. The standards allow all vendors to easily develop interoperable management solutions that lower management complexity and cost, especially in a heterogeneous, multi-vendor environment. For example, by supporting these management standards, virtual machines and their deployments can be managed in the same fashion, independent of vendors. The entire virtualized environment could be managed from a single management console.

DMTF standards for managing virtualized systems are built on and extend the existing standards for managing servers called Systems Management Architecture for Server Hardware (SMASH) and the underlying DMTF management data model called CIM (Common Information Model). Due to this, vendors can develop management features that are consistent for both physical and virtual systems. Administrators can then easily leverage their familiarity with server management to manage virtual systems. This lowers the administrator's learning curve when introducing new virtualization technologies, reduces complexity and thus lowers IT costs of adopting virtualization.

## Elements of System Virtualization and Management

The resources that make up the virtualization environment are typically provided by one or more host computer systems. A virtualization layer (typically firmware or software, but sometimes hardware) manages the lifecycle of a virtual computer system.

The virtual computer system is composed of resources allocated or assigned to it from the host computer system. A virtual computer system may be active and running an operating system and applications with a full complement of virtual devices defined and allocated. The virtual computer system may also be inactive with no software running and only a subset of the virtual devices actually allocated. A key administrator responsibility in this environment is managing the operational lifecycle of these virtual systems.

Resources of the virtual computer system may have different properties or qualities than those of the underlying physical resources. For example, virtual resources may have different capacities or qualities of service for performance or reliability than those of their underlying physical resources. Managing relationships between virtual and physical resources adds complexity to administration tasks in a virtualized environment.

## Using DMTF Standards for Managing Virtualized Environment

Managing a virtualized environment combines familiar administration tasks, such as managing physical systems and resources, with new tasks introduced by virtualization itself. DMTF standards for managing virtualization system strive to simplify these tasks by providing standard, consistent ways of discovering, configuring, managing and monitoring virtual computer systems and their underlying physical resources.

### Discovery and Inventory

To effectively manage an IT environment, administrators need an accurate view of the systems, components and other managed targets deployed. This includes not only identifying information about each target, but also configuration, asset, and other inventory information. Ideally, such information is automatically discovered by the administrator's management tools or console, rather than being manually entered and maintained.

DMTF standards for virtualization management define consistent mechanisms for discovering virtual machines deployed and their attributes. Moreover, the DMTF SMASH standard for server management also supports discovery of physical systems and attributes. When combined, vendors are enabled to implement solutions that can automatically provide a holistic view of the administrator's virtual and physical environment.

#### **Ongoing Lifecycle Management**

In an operational environment, virtual systems are not static entities. Their configurations may change to meet new demands. They may be enabled, disabled or suspended at different points in time. Managing the operational lifecycle of a deployment of virtual systems is an ongoing and potentially time-consuming administrator task.

DMTF standards for system virtualization management cover various aspects related to the control and management of the operational lifecycle of a virtual system. The implementation of these standards enable consistent management of the complete lifecycle of a virtual computer system including the creation, modification, enabling, disabling, suspending, creating snapshots, as well as monitoring a virtual computer system for these changes.

#### **Monitoring and Diagnostics**

Another critical operational task is monitoring of both virtual and physical resources. Monitoring includes the detection and tracking of changes to the environment, configuration, as well as monitoring of health and performance. In a virtualized environment, monitoring the health of deployed systems can be complex as administrators need to monitor both virtual and physical resources. Moreover, if a problem occurs, the diagnostics process will need to include a correlation between virtual resources and the physical ones they rely on.

DMTF standards for both virtual system and server management provide consistent ways for monitoring the health of computing resources. In addition, the standards also support a mapping between virtual and physical resources, which allows vendors to develop management capabilities that can monitor and diagnose issues easier across both the virtual and physical IT environment. This further simplifies the tasks of the administrator responsible for managing a deployment of virtualized systems.

## **Evolving the Standard for Managing Cloud Computing Systems**

DMTF continues to work on expanding and improving industry standards for cloud computing. DMTF has developed an Open Cloud Standards Incubator which will be expanding the current standards to meet the new needs in this emerging computing paradigm. For more information on this work please visit [www.dmtf.org/cloud](http://www.dmtf.org/cloud) and for more information on all of the DMTF virtualization management standards please visit [www.dmtf.org/vman](http://www.dmtf.org/vman).

## **Conclusion**

As more and more IT organizations deploy cloud computing solutions, they find that the technology brings many benefits but also trade-offs due to the increased complexity of managing such an environment. Added management complexity means higher overall IT administration costs.

DMTF standards for system virtualization management and for cloud computing environments helps vendors develop management solutions that reduce complexity and thus mitigate management complexity and costs for a virtualized environment, especially for heterogeneous deployments.

## **More Information**

For more information about DMTF and details about its published standards, visit [www.dmtf.org](http://www.dmtf.org).

## **About DMTF**

With more than 4,000 active participants representing 44 countries and nearly 200 organizations, the Distributed Management Task Force, Inc. (DMTF) is the industry organization leading the development, adoption and promotion of interoperable management standards and initiatives. DMTF management technologies are critical to enabling management interoperability among multi-vendor systems, tools, and solutions within the enterprise. By deploying solutions that support DMTF standards, IT managers can choose to deploy a mix of systems and solutions that best meet their users' needs, while reducing management complexity and total cost of ownership. Information about the DMTF technologies and activities can be found at [www.dmtf.org](http://www.dmtf.org).