HIGH AVAILABILITY IN VIRTUAL ENVIRONMENTS
SOLUTIONS BRIEF

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HIGH AVAILABILITY IN VIRTUAL ENVIRONMENTS WITH VERITAS CLUSTER SERVER AND SYMANTEC APPLICATIONHA

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Introduction

Symantec ApplicationHA is an easy-to-use availability solution specifically built for providing application availability in virtual environments. Veritas Cluster Server is the industry's leading clustering solution for reducing business critical applications' planned and unplanned downtime. Through a combination of Veritas Cluster Server and Symantec ApplicationHA, Symantec delivers the broadest out-of-box high availability and disaster recovery support for physical and virtual platforms, databases and mission-critical applications.

High Availability in virtual environments

Server consolidation, one of the most immediate cost-minimizing benefits of server virtualization, provides the ability to run a large number of applications in different virtual machines hosted in the same physical server. However, as the number of critical applications running in the server increases, the importance of ensuring the high availability of this server increases multifold. In addition to protecting against traditional infrastructure availability risks such as storage, networking and power, the virtualized environments impose the additional requirement of ensuring that the virtual machines are highly available as well.

Within any enterprise, there are a number of applications that are critical to the success of the business. Regardless of whether the applications are running in physical or virtual environments, the Service Level Agreement (SLA) expectations for the uptime of these critical applications remain unchanged. With the applications running within the isolation offered by the virtual machines, it is critical that the application status is factored into the overall high availability and disaster recovery considerations.

For a High Availability (HA) solution to be effective in virtual environments, it would need to provide HA not just to the virtual machines but also to the applications running inside the virtual machines. Further, the HA solution should provide this protection without compromising on the inherent benefits of server virtualization, such as easy deployment, rapid provisioning and VM migration. An additional need for the HA solution is to provide deep visibility into the application running inside the virtual machine.

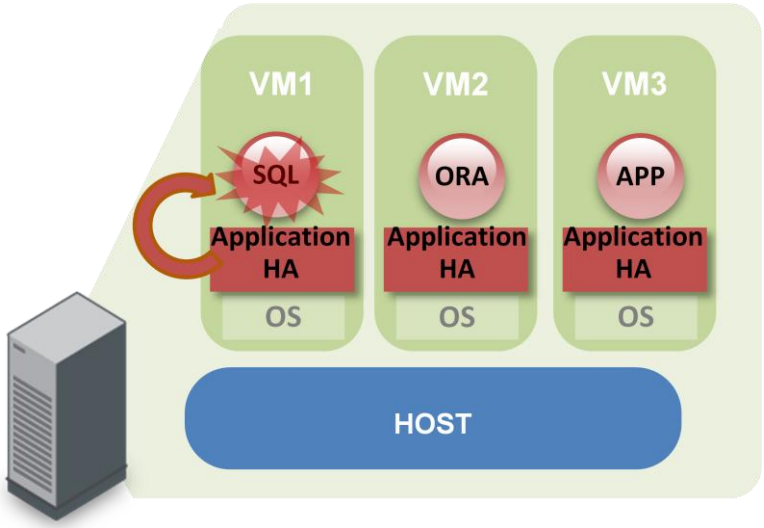
Keeping the application highly available with Symantec ApplicationHA

In order to ensure 24x7availability, applications need to be protected not just from infrastructure faults but also from application issues. For instance, a software bug can cause the application to crash, risking the application's ability to continue functioning normally. Applications running inside the virtual machines face the same availability challenges. Symantec ApplicationHA is a light weight availability product, inherited from Veritas Cluster Server, specifically built for providing detailed application monitoring inside virtual machines.

Symantec ApplicationHA is installed inside the virtual machine to provide application specific management tasks such as start/stop and availability capabilities such as application monitoring and restart. Symantec ApplicationHA's standalone architecture provides the advantages of application availability without compromising virtualization capabilities.

Symantec ApplicationHA encompasses an application agent framework and out-of-the-box support for several leading applications through application agents. The application agents provide the necessary intelligence for starting, stopping, monitoring and restarting and new agents are introduced on a regular basis to enable protection of more applications in virtual environments[2]. Further, when an application is started, ApplicationHA can also start up all its infrastructure dependencies by defining the related components as dependent resources for this application. This dependency model abstracts the internal complexities of application management and provides administrators with a single standard command to start or stop any supported application running inside the virtual machine.

The resources that comprise an application are continuously monitored at specified time intervals to ensure proper operation. If the monitoring of a resource detects a failure, ApplicationHA restarts the application, followed by a soft or graceful reboot of the VM. This remediation would typically clear the fault condition and make the application available. If the application is not recoverable even after the specified number of restarts, ApplicationHA, in the standalone mode, will report the application as faulted, so that it can receive the necessary administrative attention.



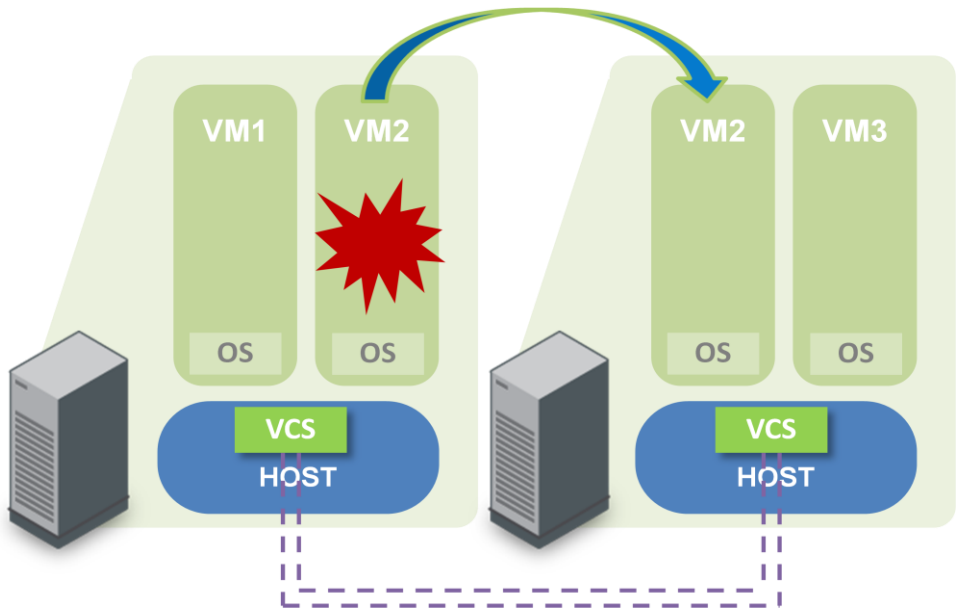
Keeping the infrastructure Highly Available with Veritas Cluster Server

Veritas Cluster Server provides availability across any distance for virtual environments, enabling local high availability as well as global disaster recovery. Veritas Cluster Server can detect faults in the Virtual Machine and all its dependent components, including the underlying storage and networking resources. When an infrastructure risk that impacts the physical server is detected, say a network failure, Veritas Cluster Server gracefully shuts down the virtual machines that are currently active on this physical server, restarts the virtual machines on an available standby server and makes the storage and networking available to the restarted virtual machines. In addition to protecting the virtual machines against physical

server faults, Veritas Cluster Server also monitors the virtual machines and restarts them in the event of virtual machine faults.

While most failover clustering solutions employ a traditional poll-based monitoring approach to detect application and infrastructure faults, Veritas Cluster Server employs breakthrough Intelligent Monitoring Framework (IMF)[1] capabilities to leverage operating system event notifications to asynchronously detect faults and initiate immediate failover of critical resources to an available standby server. As the number of critical resources protected by the clustering solution increases, asynchronous monitoring provided by Veritas Cluster Server saves significant CPU costs and frees up the computing power for running the virtual machines.

Veritas Cluster Server provides automated recovery of virtual machines across any distance, enabling the protection of the virtual machines and the applications within from site level disasters. Through its integration with all leading hardware replication vendors, Veritas Cluster Server effectively manages the replication of application data and virtual machine boot images as part of the Disaster Recovery failover and failback. In addition, Veritas Cluster Server provides the ability to automatically update the virtual machines' configuration information such as IP address and DNS information, thereby speeding up and automating the overall disaster recovery.



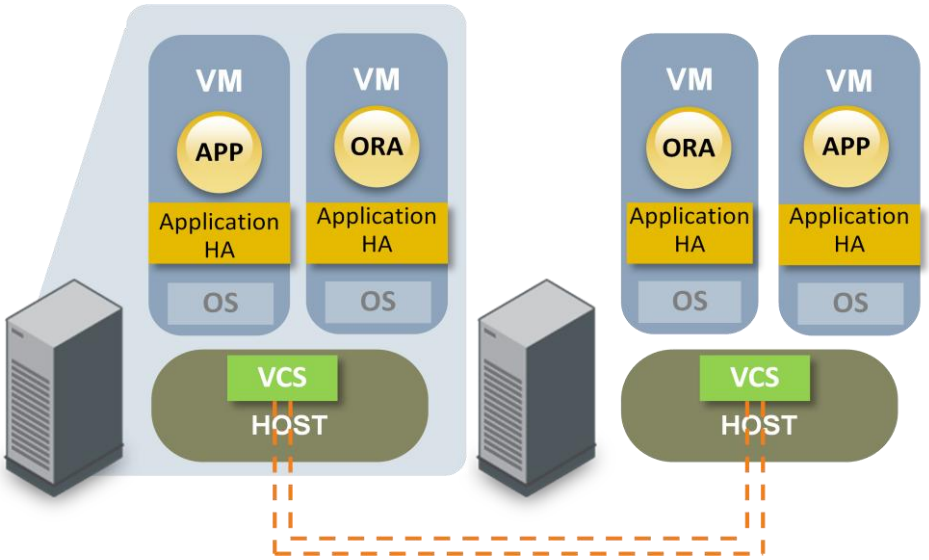
Comprehensive high availability with Veritas Cluster Server and Symantec ApplicationHA

ApplicationHA, when deployed in the stand-alone mode provides application restart as the highest level of recovery from application faults. However, application restart might not be sufficient remediation for ensuring the availability of business-critical tier-1 and tier-2 applications. This is especially true when the application fault is due to infrastructure issues, such as a network failure, or when the application has lost access with its data store. ApplicationHA provides modular integration with Veritas Cluster Server VM/HA to handle such availability challenges with advanced application recovery capability.

In the coordinated application recovery model, ApplicationHA provides the first level of in-guest application availability without any clustering needs, while Veritas Cluster Server provides virtual machine high availability (VM/HA) by clustering the physical servers at the host level. ApplicationHA continuously monitors the application and in the event of an application fault, provides several configurable levels of application recovery:

- Level 1: Application restart by ApplicationHA
- Level 2: Virtual Machine restart by Veritas Cluster Server
- Level 3: Virtual Machine failover to standby physical server by Veritas Cluster Server

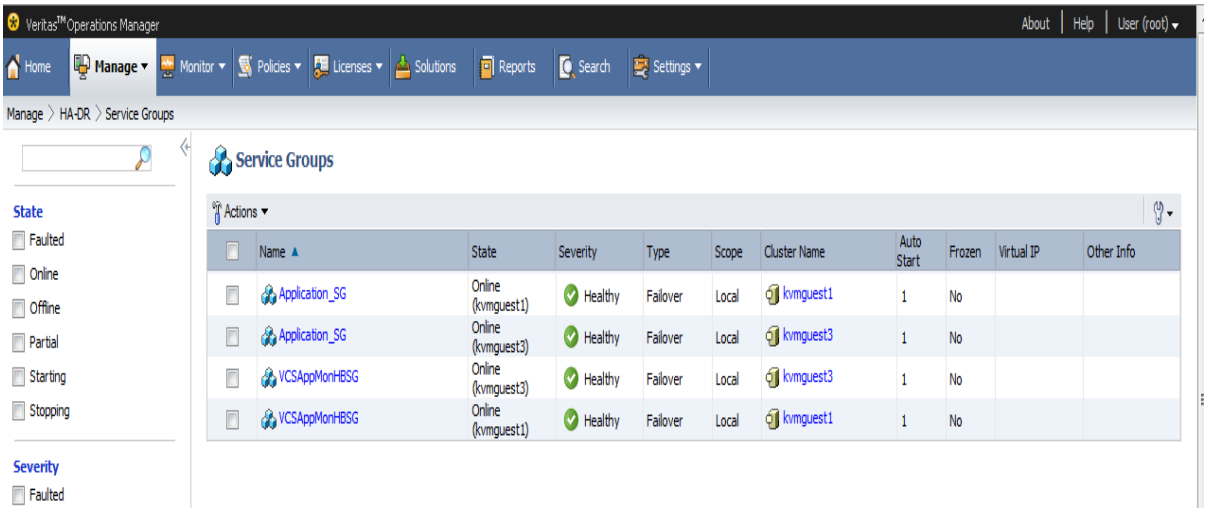
ApplicationHA continuously exchanges information with the underlying Veritas Cluster Server High Availability engine to provide application status to Veritas Cluster Server VM/HA. When an application fault is detected and an application restart does not resolve the fault, ApplicationHA conveys this information to Veritas Cluster Server, which then provides the next level of remediation for the application fault by restarting the virtual machine. If the VM restart is still not successful in resolving the application fault, then Veritas Cluster Server fails over the VM to a standby server. When the application fault is due to a transient issue with the operating system inside the VM, VM restart would resolve the issue. On the other hand, if the application has lost its access to the data disks, VM failover to the standby server would re-establish the connection and resolve the application fault.



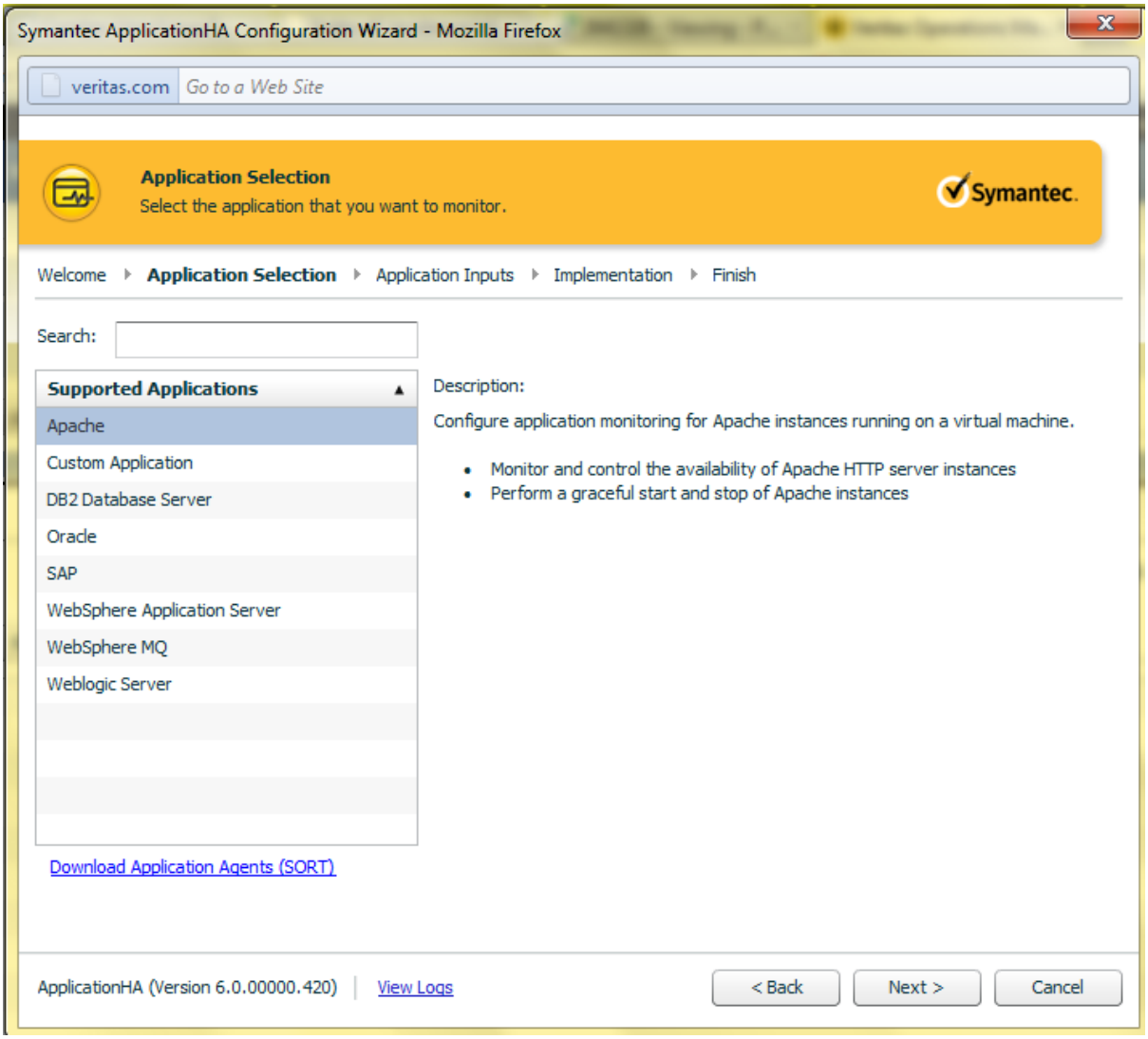
The modular configuration provides the multiple levels of fault remediation without introducing any clustering complexity at the level of the Virtual Machine. This enables the IT administrators to run Tier-1 and Tier-2 business critical applications in a virtualized environment with HA protection and without any compromise of the operational benefits provided by virtualization technology. By intelligently leveraging its status exchange channel with ApplicationHA, Veritas Cluster Server supplements the application availability provided by ApplicationHA while continuing to provide infrastructure and VM high availability.

Application visibility and HA Management through Veritas Operations Manager

ApplicationHA provides visibility into the applications running inside the virtual machine through Veritas Operations Manager (VOM). VOM is the integrated management console for Storage Foundation, Veritas Cluster Server and ApplicationHA environments. With a comprehensive datacenter level dashboard view, VOM provides visibility into all the Veritas Cluster Server clusters that have been configured in the datacenter. Further, VOM provides the ability to perform all high availability administration tracks, such as planned migration of critical applications, through its simple-to-use Graphic User Interface. The health of all the virtual machines protected by Veritas Cluster Server can be viewed through VOM's dashboard.



Veritas Operation Manager's ApplicationHA configuration wizard enables simple configuration and administration of ApplicationHA. The wizard provides auto-discovery of the application configured inside the virtual machine and enables application availability, with the desired sequence of application fault remediation. Regular administrative tasks such as enabling or disabling communication of ApplicationHA with Veritas Cluster Server VM/HA and specifying that the application is undergoing planned maintenance can all be performed through VOM's simple interface. VOM provides the ability to run regular health checks on the applications and the virtual machines at pre-specified time intervals in order to get a proactive assessment of the HA readiness of the virtual environment.



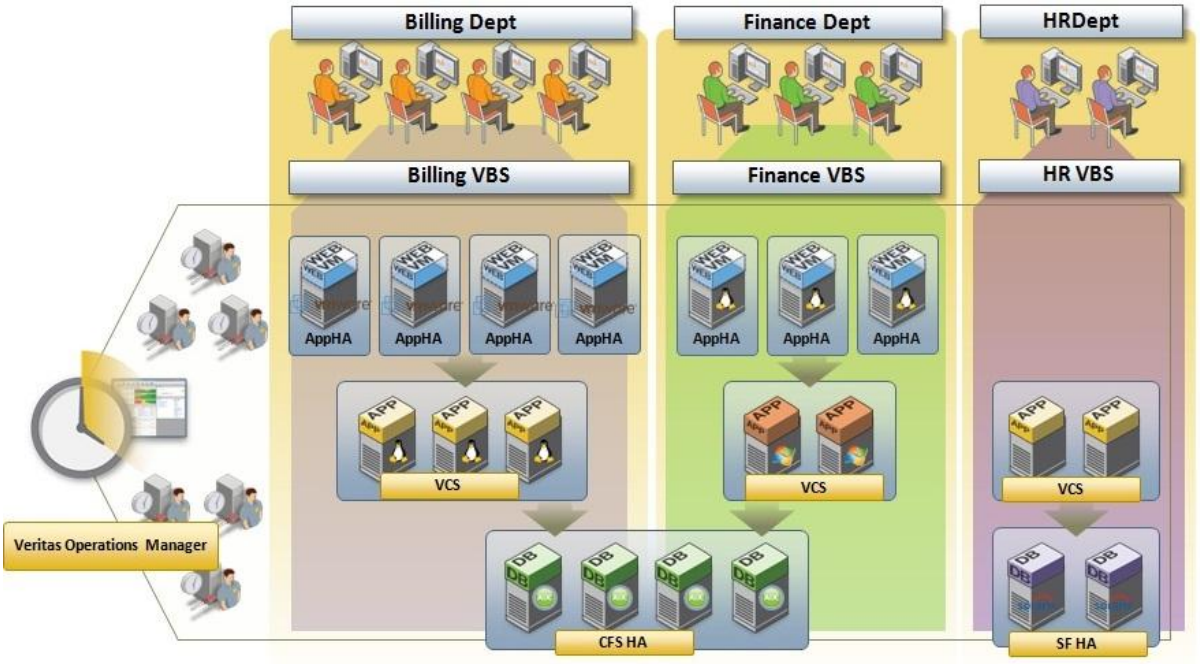
Symantec ApplicationHA and Virtual Business Services

To accommodate evolving business needs, today's data centers consist of multiple layers of physical and virtual environments, each with its own administrative tools and authorization requirements. This creates an end-to-end management challenge with applications or entire business services composed of multiple components running on different tiers and operating systems that interact with each other. In order to meet the SLA requirements of these critical business services, not only do IT administrators need to make each component highly available but they should also ensure that each component reacts to the availability events in the underlying tiers in a such a manner as to keep the entire service available to its clients.

To address this challenge, Symantec has introduced Virtual Business Services[3], a comprehensive solution that is aware of the complete business service and can take action in the event of a failure. While ApplicationHA and Veritas Cluster Server makes the individual application components highly available, Virutal Business Service provides a simple way to define dependencies between the application components and thereby provide end-to-end service availability. When an individual component of the service fails, Veritas Cluster Server or ApplicationHA independently recovers the failed application and then

automatically conveys the HA event information to the dependent application components. The end result is faster recovery and minimal downtime—all with no manual intervention.

Veritas Operations Manager provides end-to-end visibility of the Virutal Business Service, allowing for simple access to complicated administration tasks such as service start and stop, which require orchestrated administration across multiple tiers. Through the VOM dashboard view, IT administrators can get consolidated summary status for the entire service without having to infer the overall status from the current status of the individual components. Further, VOM provides the ability to drill-down from a service to its individual components – when these components are running in virtualized environments, ApplicationHA provides the necessary additional insight into the application.



Conclusion

Symantec ApplicationHA provides a virtualization technology agnostic application availability solution, enabling IT administrators to confidently virtualize business critical applications. In conjunction with virtual machine high availability provided by Veritas Cluster Server, ApplicationHA provides a coordinated and comprehensive solution to automatically recover applications from the most common availability challenges. With Virtual Business Services powered by Veritas Operations Manager, ApplicationHA enables one or more virtualized application components to be managed as part of critical business services. Overall, this solution represents another leap forward in providing support for the most critical applications within virtualized environments.

Appendix

Note regarding ApplicationHA support in VMware environments

VMware HA provides a simple, reliable way to increase the availability of virtual machines hosting critical applications. VMware HA is a virtualization-based distributed infrastructure service of VMware vSphere, which monitors the health of virtual machines and the VMware ESX® hosts upon which they reside. If a fault is detected, the virtual machine is automatically restarted on another ESX host with adequate capacity to host it. Symantec ApplicationHA[4] integrates with VMware HA to provide coordinated application recovery.

Note regarding ApplicationHA support in IBM AIX LPAR environments

In IBM AIX Logical Partitions (LPAR) environments, Veritas Cluster Server is installed inside a designated LPAR called Management LPAR and provides coordinated application recovery through exchange of status information with ApplicationHA installed inside the managed LPARS hosting the critical applications.

Platform support for ApplicationHA

Virtualization Technology	**Infra HA**	**Management**	**Guest Operating System**	**Sample Supported Applications**
VMware	VMware VM/HA	VMware vSphere Veritas Operations Manager (VOM)	Windows	SQL Server Exchange Server IIS SAP Generic Application
			RedHat Linux (RHEL) Suse Linux (SLES)	Oracle WebLogic WebSphere SAP NetWeaver DB2 Generic Application
RedHat Kernel Virtual Machine (KVM)	Veritas Cluster Server	VOM	RedHat Linux (RHEL)	Oracle Apache DB2 WebSphere Generic Application
Solaris Logical Domain (LDOM) Oracle VM for Solaris Sparc	Veritas Cluster Server	VOM	Solaris	Oracle Apache Generic Application
AIX Logical Partition (LPAR)	Veritas Cluster Server	VOM	AIX	Oracle Apache DB2 Generic Application

Typical Use Cases

Use Case description	Recommended solution
• Provide High Availability for a mission critical application hosted inside a Virtual Machine • Continuously monitor the application and restart the application to recover from faults.	Symantec ApplicationHA inside the VM
• Provide High Availability for the virtual machines (VM/HA) by monitoring each VM for availability risks. • In the event of a VM failure, restart the VM on the same or standby server. • Detect availability risks impacting the physical server and ensure all the VMs are failed over to a standby server.	Veritas Cluster Server in the host or management VM forming a Veritas Cluster Server host cluster
• Provide High Availability for a mission critical application hosted inside a Virtual Machine with advanced multi-level fault remediation • Continuously monitor the application and recover from application faults with a configurable combination of application restart, VM restart and VM failover. • Continuously monitor the VM for availability risks and fail over the VM to standby server to ensure application availability	Veritas Cluster Server in the host or Management VM + Symantec ApplicationHA inside the VM
• Recover application faults by failing over the application to a standby VM • Enable fast failover with Intelligent Monitoring Framework and/or Cluster File System	Veritas Cluster Server inside the VM forming a Veritas Cluster Server guest cluster

References

1. Intelligent Monitoring Framework (IMF) is a Veritas Cluster Server technology that empowers the immediate detection of application failures
2. Symantec Operations Readiness Tool (SORT) provides information on the most up-to-date list of applications supported by ApplicationHA
3. Virtual Business Services is a new Veritas Cluster Server functionality introduced in SFHA 6.0 release, targeted at providing increased resilience for multi-tier applications
4. Symantec ApplicationHA provides application availability and visibility in VMware virtual environments