WHITE PAPER:
VIRTUALIZE BUSINESS-CRITICAL
APPLICATIONS WITH CONFIDENCE

Confidently Virtualize Business-critical Applications in Microsoft Hyper-V with Symantec ApplicationHA

Who should read this paper

Windows® Virtualization IT Architects and IT Director for Windows® Server

Symantec

Content

Introduction

All businesses have a core set of applications that are critical to successful growth. These applications require a higher level of availability than other applications and services in the organization. In physical environments, traditional high availability clustering solutions are most commonly used to increase the availability of business-critical applications. These solutions help minimize unwanted downtime and also minimize planned maintenance downtime, by providing application failover to additional standy-by servers in the cluster.

There is a trade-off however, to increasing application availability through traditional high availability clustering. Businesses can see costs surge in terms of additional hardware, clustering software/support, as well as costs and complexities added becuase of increased operational management requirements. For example, management costs increase due to the need to maintain multiple systems that are identical in configuration and patch levels. It also becomes extremely complex for IT to deliver on business needs while keeping within allocated budget. These complexities typically result in the use of small two-node clusters deployed for only the most mission-critical applications, and the majority of other applications also needed to maintain competitive business continuity are not clustered at all.

Native High Availability in Microsoft Hyper-V Environments

As customers implement virtualization, they recognize benefits far beyond a simple reduction in servers. Cost is one of the key factors in the move from physical to virtual for many enterprises. Because of this many organizations prefer to virtualize using Microsoft Windows Server 2012/R2, to reduce costs not only from a server reduction standpoint but also from on-going licensing. With the latest version of Microsoft Windows 2012/R2 with Hyper-V (v3) role enabled, Microsoft demonstrates that it is ready for the enterprise and can match features and functionality provided by other virtualization solutions in the market.

Availability is of upmost importance to enterprises that have critical SLAs to meet. Utilizing Microsoft Hyper-V Live Migration technology, IT administrators are able to move applications for server maintenance with zero downtime and data loss. Coupled with the operating system isolation natively provided by Hyper-V virtualization, it is very simple to provide a small set of highly consolidated servers capable of providing very high uptime with reduced administrative cost.

Microsoft Failover Clustering can also be leveraged for meeting SLAs and provides a simple, reliable way to increase the availability of virtual machines hosting critical applications. Failover Clustering has been enhanced in Windows 2012/R2 to leverage virtualization. It assists in monitoring the health of virtual machines along with the Windows 2012/R2 hosts running the Hyper-V role upon which they reside. If a fault is detected, the virtual machine is automatically restarted and upon recurring failure can be moved to another Hyper-V host with adequate capacity to host it. Failover Clustering is included in all Windows 2012/R2 editions and can be switched on simply by enabling the Failover Cluster Role within the server and following a simple wizard which guides through the whole process. As Failover Clustering utilizes the storage and network connectivity already in place to support Live Migration, enabling high availability is as simple as ensuring you have adequate server capacity to handle failure of one or more Hyper-V hosts.

Challenges with Native Virtualization of Tier 1 & 2 Applications

Failover Clustering and Live Migration technology provide increased availability for a large percentage of customers. In fact, more than 80 percent of Microsoft customers leverage one if not both of these technologies to protect most or all of their virtual machines running on Windows 2012/R2. However, a method to increase the availability at the application layer is often desired, especially for business-critical Tier 1 and Tier 2 applications. Without this application level protection, organizations are exposed to application failures that might happen inside the virtual machine. In many cases, organizations have attempted to deploy a traditional application clustering solution into the virtual machine's guest operating system for this purpose.

While this works, it also creates significant issues with the day-to-day operations of virtualized environments, as these solutions are designed purely for physical environments. Issues include the added complexity of maintaining multiple identical virtual machines to properly host failover, additional capacity needed to host spare servers, and difficulty in mapping application location to a specific virtual machine within the Hyper-V management solution. Storage configuration requirements for in-guest clustering can also be a challenge, as pass through disk access would be required for most operating system platforms with only Windows 2012 R2 having support for shared VHDX virtual disks.

Virtual machine monitoring in Microsoft Windows 2012

With the release of Windows 2012, Microsoft has introduced a Heartbeat Monitoring Service for Failover Clustering that allows for virtual machine resource level resilience, and also provides some basic application service level monitoring for guests running Windows 2012 and 2012 R2. The Heartbeat monitoring service can give some level of protection to an application running within a virtual machine but relies on the administrator to be fully aware of the application running and the various components that can make up that application.

Working closely with Microsoft on the Heartbeat monitoring service has given Symantec the ability to deliver Symantec™ ApplicationHA for the Hyper-V platform to make it truly enterprise-ready. ApplicationHA can now be deployed inside a Hyper-V guest OS. ApplicationHA leverages its enterprise application monitoring components from its heritage of Symantec™ Cluster Server, powered by Veritas. Utilizing the Heartbeat monitoring service along with Failover Clustering, ApplicationHA informs when problems arise so that Failover Clustering can remediate further to resolve issues with the virtual machine. More importantly, to simplify the whole user experience, ApplicationHA provides the administrator with wizards that assist in auto discovery of applications running within the virtual machine, and within minutes the administrator can configure the application. This minimizes operational complexity for the admin having to perform this function for hundreds or thousands of virtual machines.

This joint solution includes two layers of protection. The first is the in-guest protection provided by ApplicationHA. This application-layer protection includes application-specific capabilities such as component-level monitoring, restarting of failed services, performance monitoring, and so forth. The second layer is Failover Clustering, which can restart the virtual machine in cases where the in-guest solution cannot resolve the issue. Heartbeat monitoring service is enabled as default with failover Clustering and switched on for Hyper-V virtual machines that are used. Figure 1 shows how the administrator can check that the Health monitor it enabled, by viewing the properties of the virtual machine configuration.

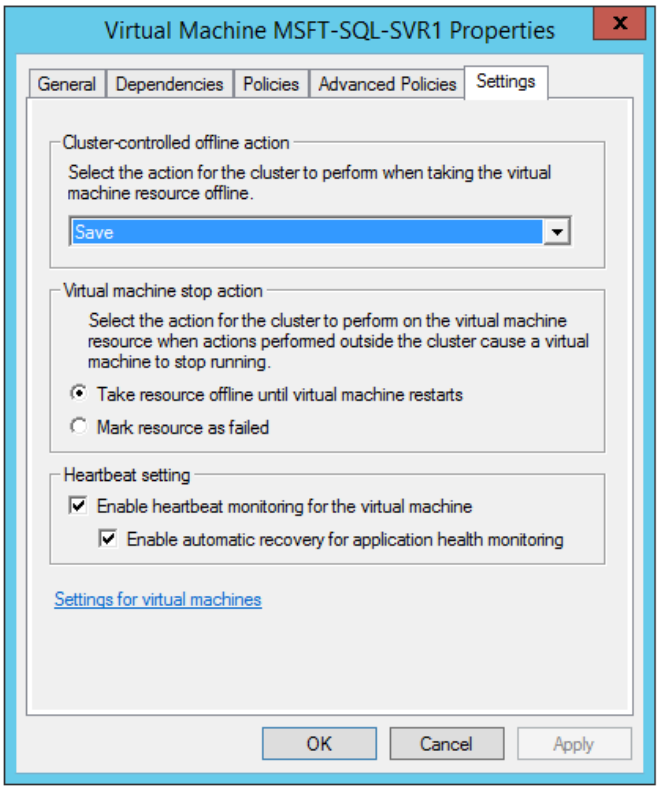


Figure 1. Configuring the VM Monitoring Level to include Application Monitoring

Enterprise-class High Availability for Microsoft Hyper-V with Symantec ApplicationHA

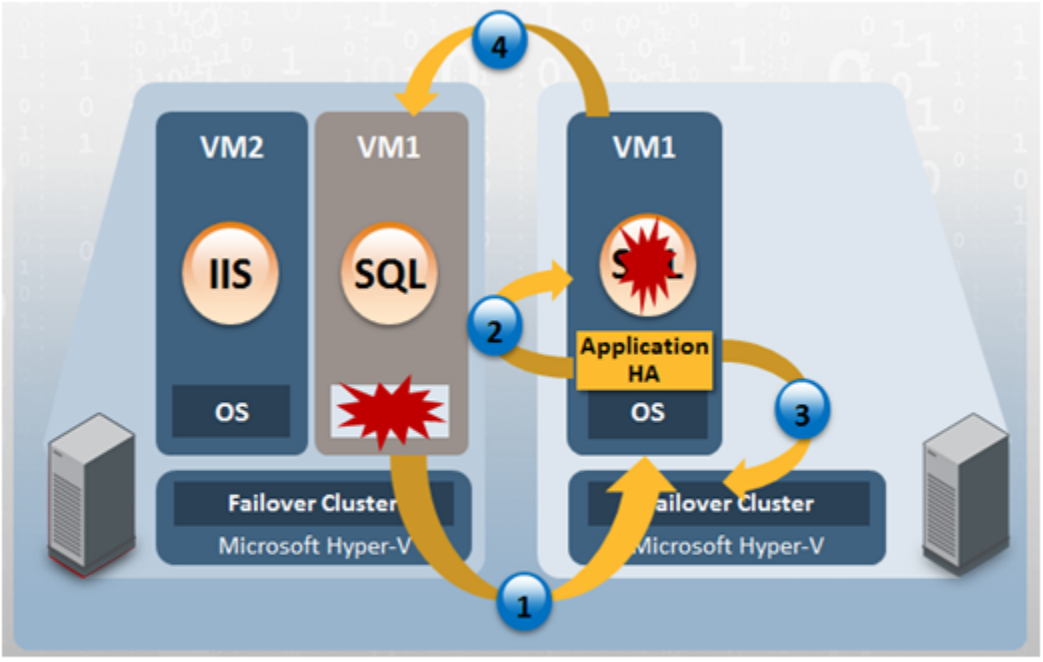
Microsoft has worked jointly with Symantec to provide an application heartbeat monitoring solution that can be leveraged from solutions like Symantec ApplicationHA. The joint solution enhances Microsoft's hypervisor solution and truly brings enterprise functionality for confidence to virtualize business-critical applications with Microsoft Hyper-V. ApplicationHA leverages more than 12 years of development of Symantec Cluster Server to provide an application monitoring package that runs inside a Hyper-V guest operating system and fully integrates with Failover Clustering and the Heartbeat monitoring service to provide virtual machine restart as needed to react to any application issue.

Both solutions together provide:

- Enhanced availability of Tier 1 virtualized applications by providing a mechanism to detect and recover from application failures
- Improved manageability of virtualized applications by providing visibility of the application's status and application control (starting or stopping the application) through a web interface and also management control can be given via Veritas Operations Manager (VOM)
- Reduced operational complexity and Total Cost of Operations (TCO) by eliminating the need for different operating system–based clustering products
- Enhance the availability of applications without sacrificing the use of advanced Microsoft features such as Live Migration and Failover Clustering

Symantec ApplicationHA Overview

Symantec ApplicationHA leverages the Microsoft Heartbeat monitoring service to provide comprehensive application availability in Microsoft Hyper-V. The guest component is installed in each ApplicationHA enabled virtual machine, and visibility is provided via a web browser available via a link within the virtual machine or from a browser with network connectivity on the same network as the virtual machine.



1. Microsoft Failover Cluster detects issues with VMs if faults occur and moves the affected VM
2. ApplicationHA detects issues with the application under control and attempts to restart the faulted application
3. In the event that ApplicationHA is unable to start the application it instructs a heartbeat fault with Failover Cluster
4. Failover Cluster moves the VM if the application still has issues starting

Figure 2. ApplicationHA interaction with Microsoft Failover Cluster

The guest component encompasses an application agent framework and various application agents. The application agent framework provides the infrastructure that is utilized by the application agents in their execution. The application agents are responsible for the starting, stopping, and monitoring of a given application resource or instance.

By defining the resources that comprise an application, the application agents are able to monitor, start, and stop the application instance and any related resources. For example, if a Microsoft SQL database were put under ApplicationHA control, several resources may be required in order to support the database. These might include mount points to make the storage available, the Microsoft SQL instance, a Microsoft SQL Agent to perform scheduled administrative tasks, and a Microsoft SQL Online Analytical Processing (OLAP) service for multi-dimensional analysis. These all would be individual resources that would need to be monitored to ensure proper operation of the Microsoft SQL database application.

Additionally, in order to bring the Microsoft SQL application online or offline, these resources would require a specific order of operations. To support this, resources can be made dependent on each other, similar to the depiction in Figure 3.

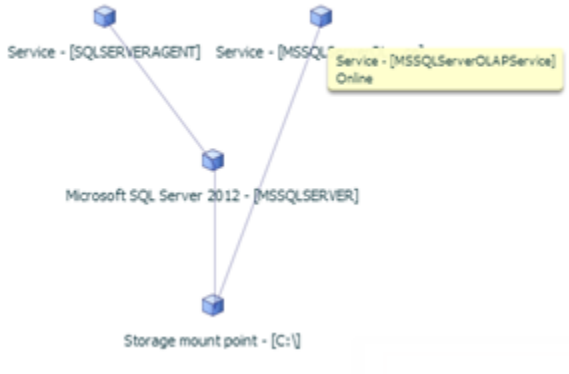


Figure 3. Microsoft SQL 2012 Application Resource Dependency

Through the use of this dependency model when an administrator starts or stops the application, they can be assured that the application resources are handled by the guest component in the correct sequence.

The resources that comprise an application are continuously monitored at a given interval to ensure proper operation. If the monitoring of a resource detects a failure, the guest component takes action:

1. The guest components attempt to restart the application within the virtual machine. The number of attempts that will be made to restart an application is configurable by the user.
2. If the application does not restart successfully, the guest components communicate to the Heartbeat monitoring service in order to trigger a clean shutdown of the virtual machine by Failover Clustering. The application is restarted as part of this graceful reboot process.

The ApplicationHA web management interface displays the status of the application (Offline/Online/ Faulted/Partial), as well as the status of the individual resources comprising the application.

In addition to providing visibility of an application's state, the ApplicationHA web management interface also allows for the management of the application and ApplicationHA features. This includes the ability to start and stop the application, the ability to enable or disable ApplicationHA functionality, and the ability to disable the communication to Heartbeat monitoring service in order to allow a user to troubleshoot a problem application without triggering a restart of the virtual machine.

Application and Platform Support

ApplicationHA provides application availability in Windows guests. It provides extensive support to common off-the-shelf Tier 1 applications such as Microsoft Exchange, Microsoft SQL, IIS, Oracle, and importantly custom applications that the business may developed in-house. Please refer to the ApplicationHA documentation for the latest information about the supported applications and platforms.

Installation and Configuration

ApplicationHA provides users with a simplified wizard-based installation and configuration process. The installation wizard allows for the installation of the guest components into a virtual machine directly from any network connected workstation that has access to the virtual machines. The installation of the guest components can be a mix of supported Microsoft Windows OS Guests.

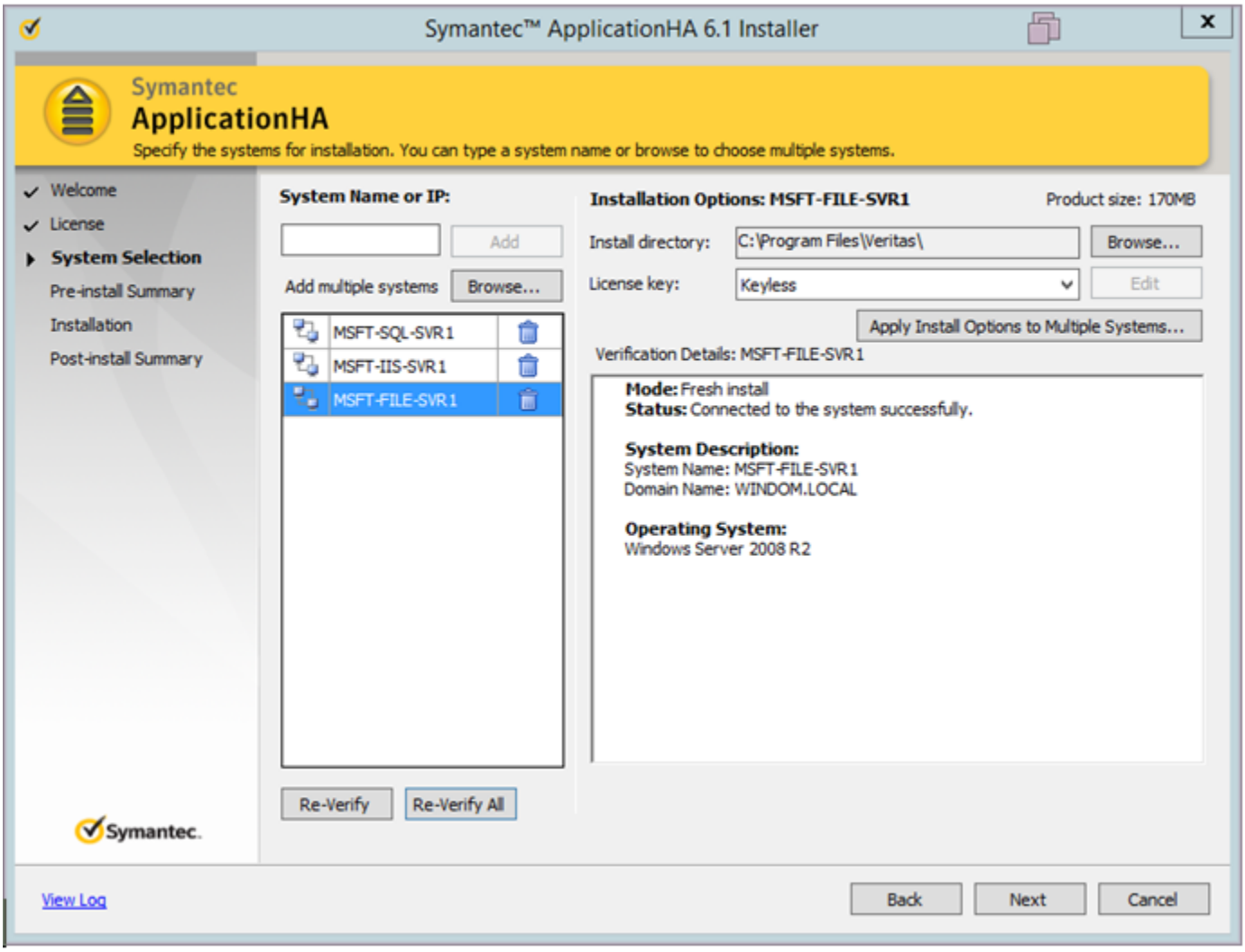


Figure 4. ApplicationHA Installation Wizard

A simple wizard-driven process is also provided by ApplicationHA to assist in configuring and monitoring an application. Off-the-shelf applications, such as Microsoft SQL or Microsoft Exchange, can be configured by this wizard using default parameters common to these applications.

Administrators can also protect non off-the-shelf, or custom, applications. The configuration process for custom applications is also wizard based, as shown in Figure 5, making it easy for users to deploy both packaged and custom applications. By selecting different services, processes and resources that need to be monitored, an administrator can provide enhanced availability to a practically limitless set of applications.

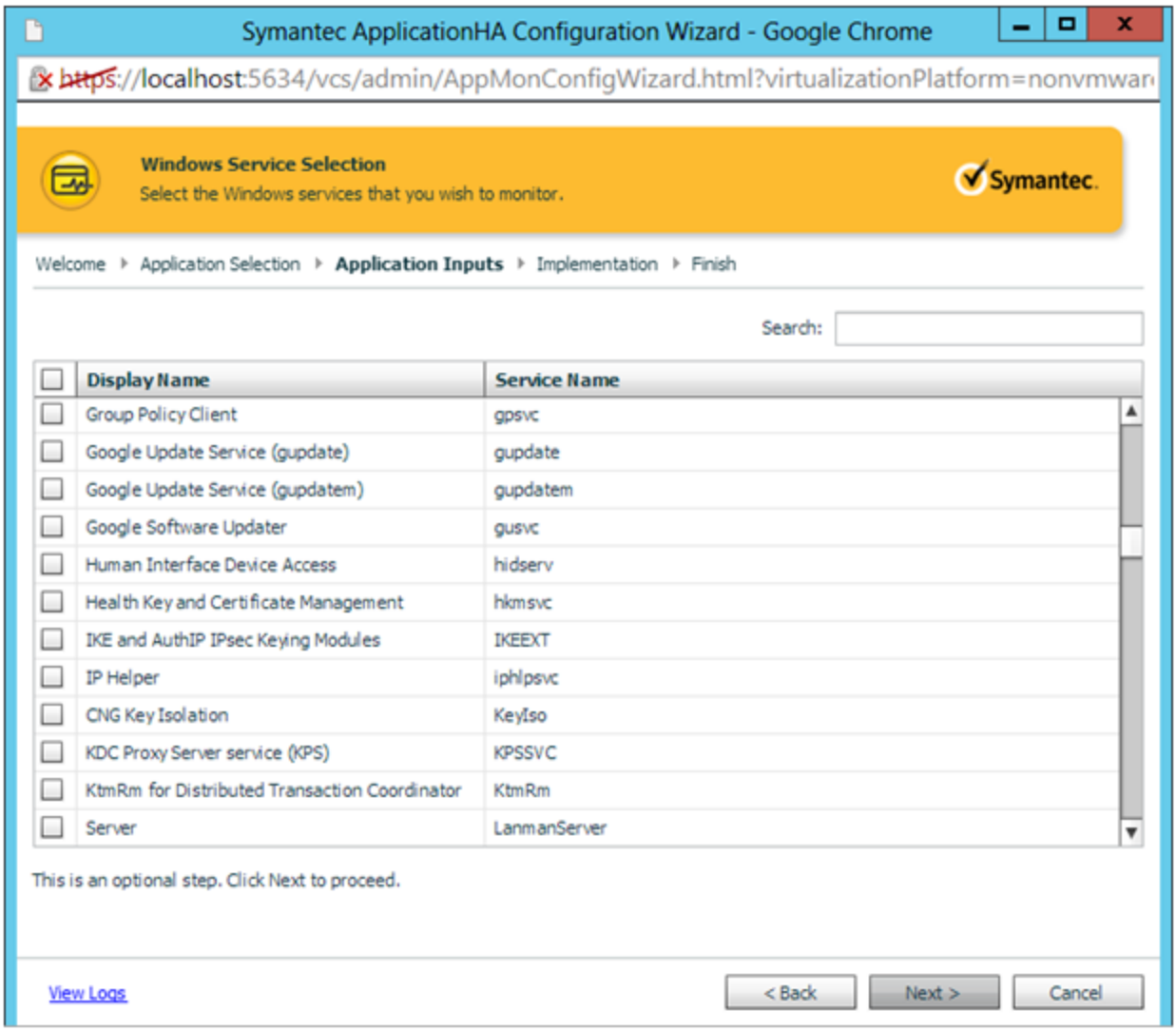


Figure 5. ApplicationHA Custom Application Configuration Wizard

Managing Symantec ApplicationHA

Symantec ApplicationHA is managed through either a Web management interface from within the virtual machine or via a workstation that has network connectivity to the virtual machine. Management is also available via Veritas Operations Manager, which can launch an interface similar to the web management interface, and can provide more detailed information on the configuration of the application components.

Additionally, it provides the ability to perform operations specific to ApplicationHA, such as:

- Start or stop an application
- Enable or disable the communication between Hyper-V hosts via Heartbeat monitor and ApplicationHA
- Configure or un-configure ApplicationHA

For example, Figure 6 shows the view of a Microsoft SQL virtual machine that has been enabled for ApplicationHA.

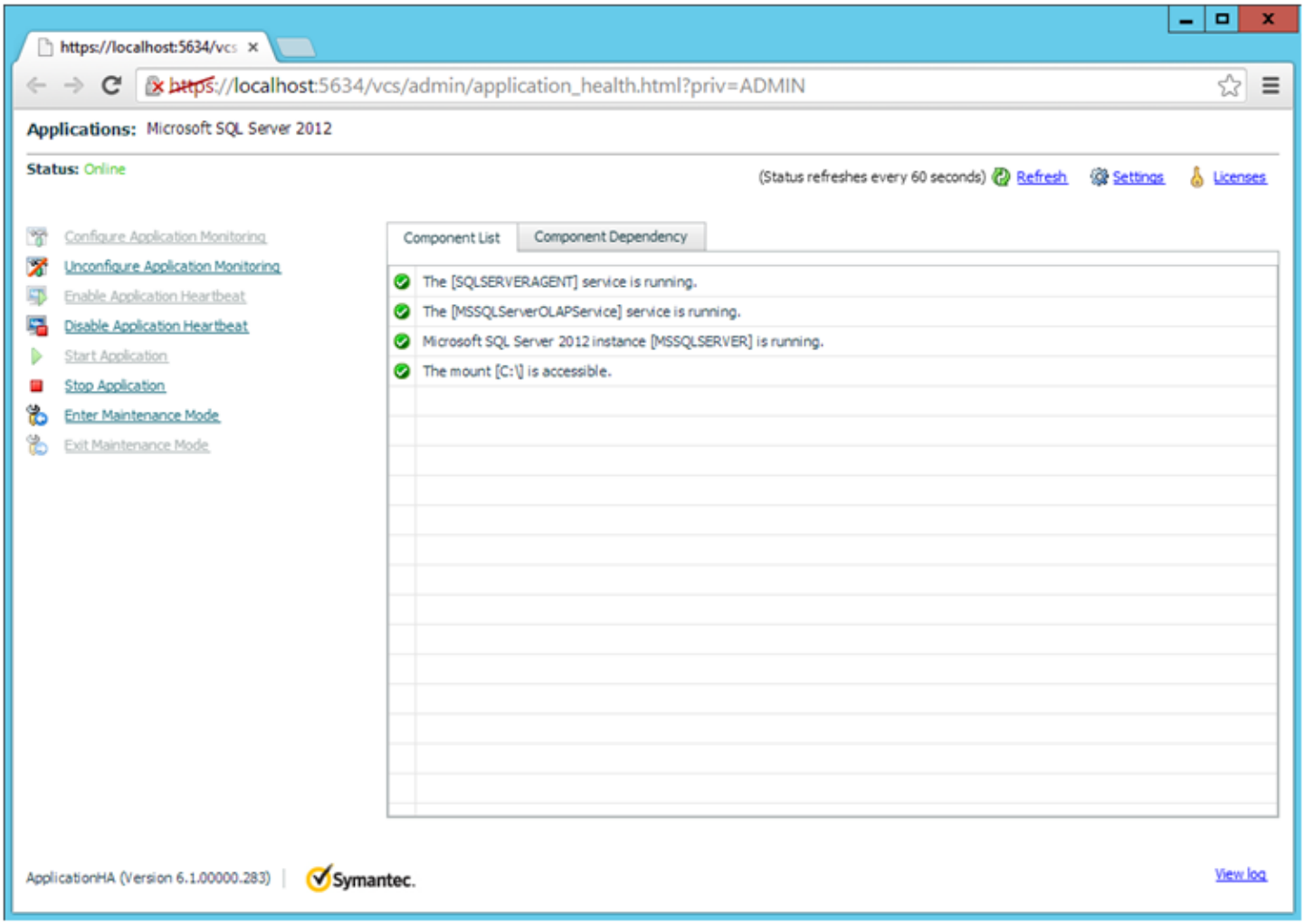


Figure 6. SQL 2012 Application Status in Symantec ApplicationHA web management interface

Multi-tier Application Recovery with Symantec ApplicationHA and Virtual Business Service

Virtual Business Service offered through Veritas Operations Manager, provides high availability and complete multi-tier business service management for business-critical services that are made up of various tiers of heterogeneous operating systems, platforms, hardware and software. It combines the power of Symantec ApplicationHA, Symantec Cluster Server, and Operations Manager.

In a multi-tier business service, different tiers usually have different requirements. One tier may require full-fledged high availability with split-second error detection and fast failover, while other tiers just need basic start and stop capability. Hence, the “one-size fits all” approach is not applicable in most cases.

Key features of Virtual Business Services include:

- Complete multi-tier management such as coordinated start and stop across different operating systems and/or platforms
- Fault management and propagation between tiers
- Multi-tier Disaster Recovery support, enabling automated Disaster Recovery of a complete Virtual Business Service
- Virtual Machine management support (start and stop)
- Multi-Tenancy and Role-Based Access Control

It is important to understand that high availability primarily is managed within each tier or layer. For example, a web tier running Hyper-V virtual machines hosting a web server, an application tier consisting of a cluster running on physical nodes, and a database tier running on another platform. The cluster is responsible for keeping services highly available within the cluster. The boundaries for an application are the ApplicationHA instance or Symantec Cluster Server cluster.

Logically, a Virtual Business Service can be seen as a container that allows service groups to be grouped into a single object. To enable Virtual Business Service, it is required that each tier has one of the following products installed:

- Symantec ApplicationHA 6.0 or later and/or
- Symantec Cluster Server 5.1 or later (including Storage Foundation HA bundles)

Note that ApplicationHA and/or Symantec Cluster Server are required in each tier. It is possible to mix and match those products to fit into your environment. In addition, it is required to have at least one Veritas Operations Manager Central Server:

- Veritas Operations Manager 6.0 or later

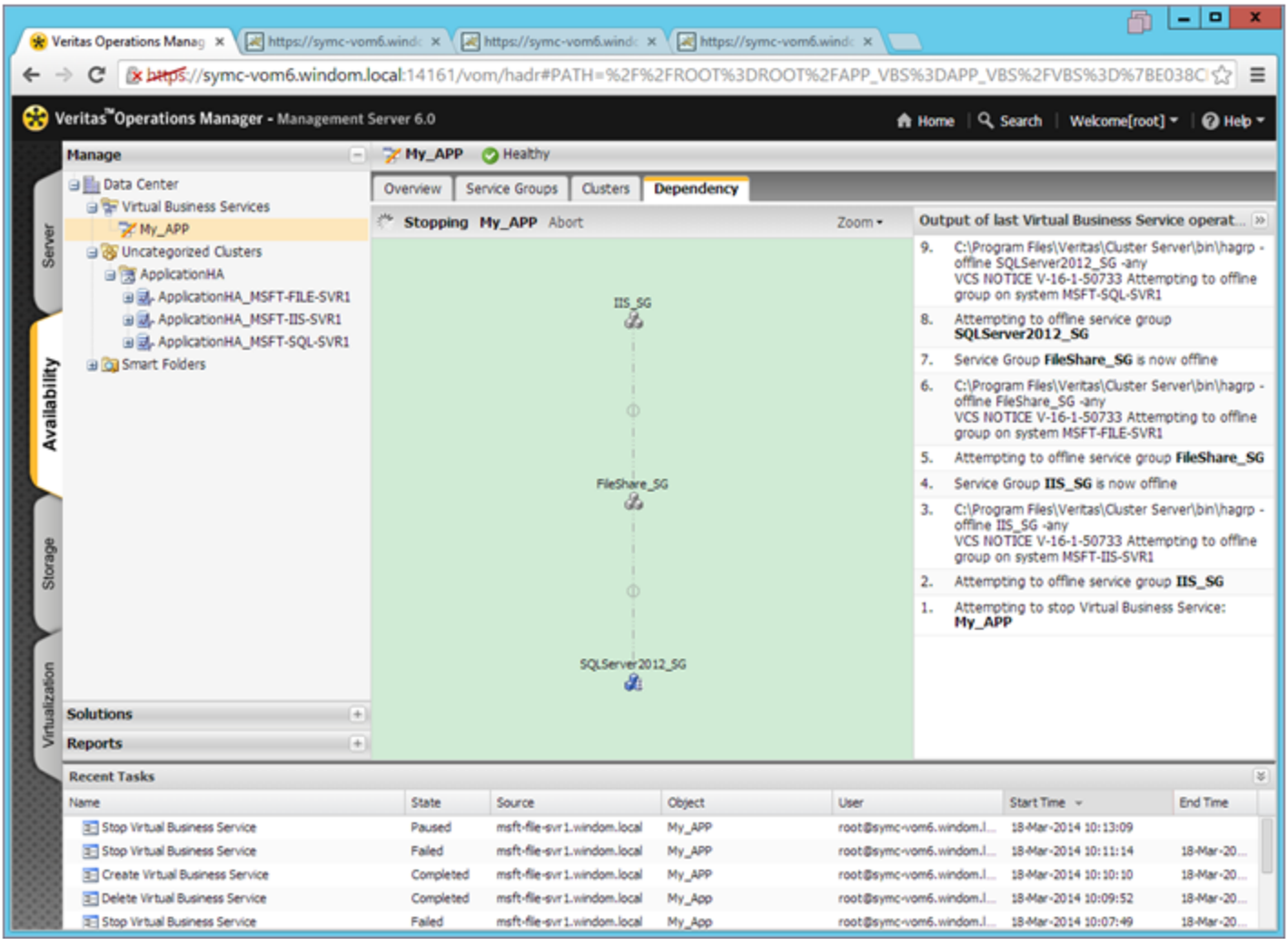


Figure 7. Virtual Business Service created for a multi-tier application consisting of SQL 2012, IIS and a Fileshare

Symantec ApplicationHA Best Practices

As with any solution, the key to a successful ApplicationHA deployment is to follow best practices. The following list highlights common ApplicationHA best practices:

- Prior to installing ApplicationHA, read the release notes and check the Symantec Operations Readiness Tools (SORT) Web site -https://sort.symantec.com/land for any software updates and late-breaking news.
- Configure the Microsoft Failover Clusters prior to installing ApplicationHA, since ApplicationHA leverages the Heartbeat monitoring service in Microsoft Failover Cluster.
- Install the ApplicationHA client inside all virtual machines configured in a Microsoft Failover Cluster. Check to make sure that Heartbeat monitoring service is enabled and automatic recovery for application monitoring is enabled. Monitoring all applications in the cluster ensures the highest levels of high availability.
- Prior to configuring application monitoring, ensure that applications are fully installed, configured, and running. ApplicationHA discovery is able to detect installed applications and automatically set up application monitoring.
- Use Veritas Operations Manager (VOM) for managing applications across physical and virtual environments from a single pane of glass, to visualize and protect multi-tier applications, or to enable users who do not have access to vCenter Server but need to visualize and control applications in Microsoft Hyper-V virtual machines.

Conclusion

Symantec ApplicationHA adds resilience to Microsoft Hyper-V environments by providing a trusted application monitoring and recovery framework. With ApplicationHA, organizations can be assured that their Tier 1 and Tier 2 applications are protected in the case of application-level failures, and with Virtual Business Service in combination with Symantec ApplicationHA and Veritas Operations Manager, critical multi-tier applications can be recovered automatically without need for manual intervention. Maintaining business continuity is important in today's super-competitive business world. ApplicationHA helps organizations maintain business continuity by minimizing unplanned downtime in their IT environments, so they can align to business needs and deliver appropriate and timely services to their end customers.

About Symantec

Symantec Corporation (NASDAQ: SYMC) is an information protection expert that helps people, businesses, and governments seeking the freedom to unlock the opportunities technology brings—anytime, anywhere. Founded in April 1982, Symantec, a Fortune 500 company operating one of the largest global data-intelligence networks, has provided leading security, backup, and availability solutions for where vital information is stored, accessed, and shared. The company's more than 20,000 employees reside in more than 50 countries. Ninety-nine percent of Fortune 500 companies are Symantec customers. In fiscal 2013, it recorded revenues of $6.9 billion. To learn more go to www.symantec.com or connect with Symantec at: go.symantec.com/socialmedia.

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