Microsoft Windows Server 2012 R2 Hyper-V on Dell PowerEdge VRTX

A Dell Reference Architecture for virtualized infrastructure

Dell Global Solutions Engineering
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Table of contents

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1 Executive Summary

Information technology (IT) teams routinely struggle with the challenges of inefficient infrastructure, including disparate hardware, the proliferation of various system management tools and hardware sprawl. The impact can include increased total cost of ownership (TCO), increased system maintenance downtime and slow application performance, which in turn affect business results.

Dell Global Solutions Engineering has proposed a novel platform for virtualized workloads, by leveraging Dell PowerEdge VRTX with Microsoft Hyper-V. This shared infrastructure platform resolves infrastructure complexities by:

- Enabling IT administrators to combine servers, storage and networking into an easy-to-deploy chassis.
- Using unified and simplified systems management to reduce potential errors.
- Ensuring more application uptime with high availability (HA).

Implementing any application solution on a shared, virtualized infrastructure results in greater consolidation and efficiency than implementing each application on a dedicated hardware. The benefits of integrating the applications and deploying the solution on a single virtualized infrastructure are as follows:

- Simplified deployment, configuration, maintenance and administration of hardware infrastructure and applications
- Single view of server, storage and networking for multiple applications
- Reduced hardware cost and administration time
- Optimized application uptime and increased business continuity by complementing application native availability with hypervisor-level HA
- Greater IT efficiency by eliminating infrastructure silos designed for individual applications

This technical paper describes the reference architecture for the pre-engineered PowerEdge VRTX with Hyper-V. PowerEdge VRTX resources can be deployed in one single pool to share between the applications or certain percentages of PowerEdge VRTX resources can be reserved for any application based on specific requirements.

This guide describes the solution in a structured way:

- Section 3: Describes the key components used in the solution reference architecture. These components are engineered to make the solution complete and effective. Understanding the components is essential for comprehending the reference architecture.
- Section 4: Describes a high level view of reference architecture, design considerations for virtualizing applications, and describes resource consolidation and other benefits achieved.
- Section 5: Describes the solution component specification and provides DellStar Solution Id.
- Section 6: Describes the backup architecture for protecting the applications by using the Dell DL4000 backup appliance.
- Section 7: Describes a summary of the overall solution and explains why PowerEdge VRTX is the best shared infrastructure platform to deploy virtualized applications.

2 Introduction

Organizations have realized the benefits of converged infrastructure – compute, storage, networking and management within a box. It provides consolidation of systems, efficient resource utilization, centralized management while sustain the total cost of ownership. Virtualizing converged infrastructures further adds efficiency and ease of management to the datacenters. Dell PowerEdge VRTX converged infrastructure offers the flexibility to tailor the computing infrastructure for specific workloads to grow and adapt per business needs.

The PowerEdge VRTX enclosure is a 5U tower/rack-based platform that combines the density and efficiency of a blade chassis and storage enclosure with the simplicity and cost benefit converged infrastructure. Microsoft Windows Server 2012 R2 Hyper-v provides capabilities to create an efficient virtual environment design by enabling server virtualization to make optimum use of PowerEdge VRTX resources.

The reference architecture in this paper presents a virtualized infrastructure build on the PowerEdge VRTX converged infrastructure and Dell Networking keeping key solution design principles like high availability, scalability and hardware abstraction in consideration.

2.1 Scope

This paper describes the implementation of Windows Server 2012 R2 Hyper-V on PowerEdge VRTX. This paper concentrates on infrastructure design principles, which include HA, virtualization best practices, hardware abstraction and resource consolidation.

In line with the target market for PowerEdge VRTX, we assume that the customer environment for the sample implementation is small and medium business (SMB) offices as opposed to data centers. For such SMB offices, the IT infrastructure typically resides in an IT closet or a machine room. Instead of managing a variety of server, storage and networking products for essential operations, these customers can now have a consolidated infrastructure with smaller foot print, efficient resource allocation and simplified management. These customers operating in an office environment have different requirements from those operating in a data center. Therefore, we have used simple virtualization architecture design for the different business applications, while meeting the solution HA requirements to reduce cost and maximize return of investment for the targeted SMB customers.

2.2 Audience

This paper is intended for IT professionals and administrators interested in designing and deploying a virtualized solution for business applications on PowerEdge VRTX with Hyper-V. While this paper provides an overview of PowerEdge VRTX, the reader is expected to have sufficient understanding of Microsoft Windows Server 2012 R2 and Hyper-V.

3 Solution Components

This reference architecture leverages the PowerEdge VRTX platform and incorporates Windows Server 2012 R2 with Hyper-V.

3.1 Overview of PowerEdge VRTX

PowerEdge VRTX is an exemplary platform that combines server, storage and networking into an easy-to-deploy, modular chassis. The PowerEdge VRTX platform is specifically designed to address and resolve IT concerns of SMBs. Many of the IT requirements in office environments are the same as those of data centers—for example, having sufficient performance to process jobs or transactions quickly; having sufficient capacity to grow over time with minimal disruption; and ensuring that systems, applications and data are highly available. Office environments range from single, stand-alone offices to multiple, distributed offices of large enterprises and organizations. PowerEdge VRTX offers optimized dimensions, security, acoustics and power options to enable a very compelling value proposition. The simple, integrated and scalable shared storage in PowerEdge VRTX addresses the needs of virtualized workloads and projected storage capacity and performance.

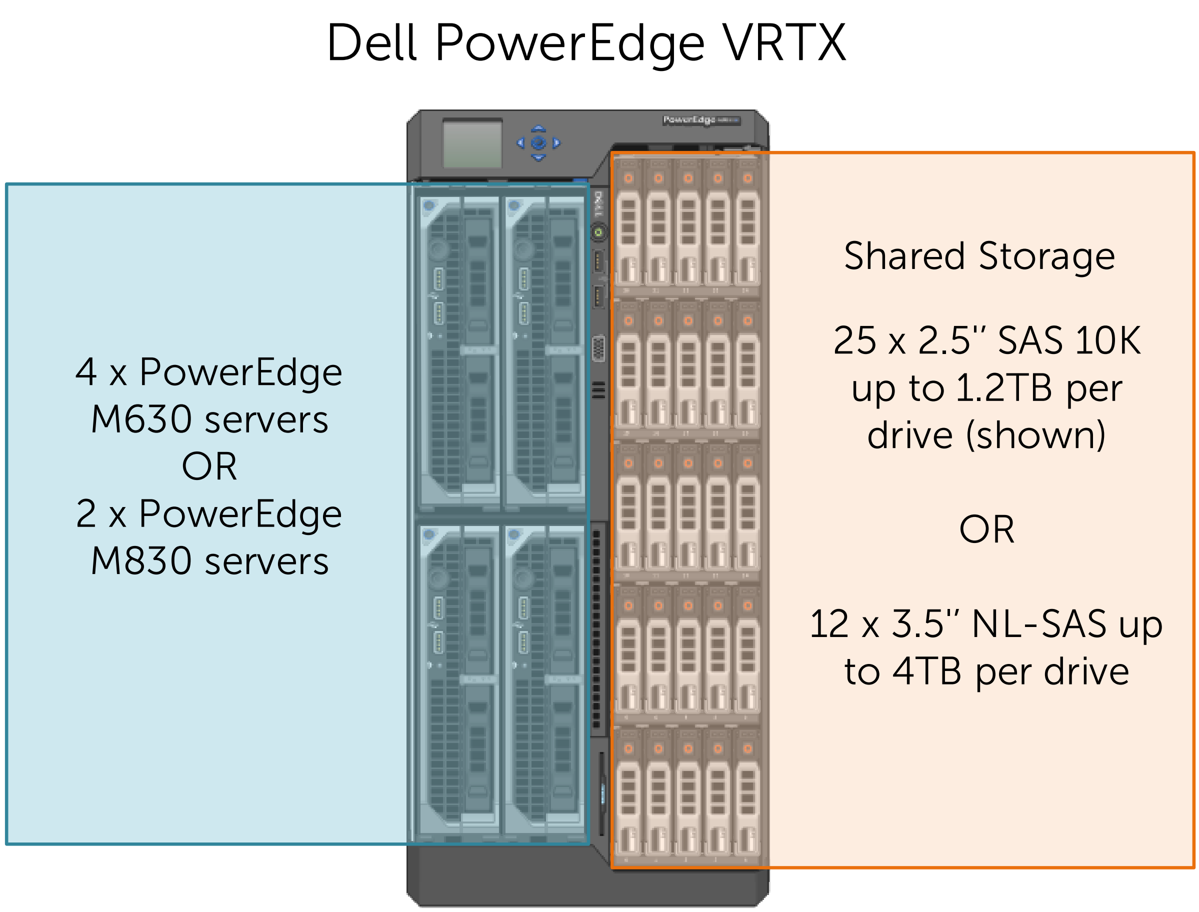

Figure 1 Dell PowerEdge VRTX logical representation

PowerEdge VRTX is a converged infrastructure that uses I/O cards in the PCIe industry-standard format to provide shared storage of up to 48 TB in the 3.5-inch HDD bay chassis. The storage is shared among up to four server nodes and is managed through the PowerEdge VRTX Chassis Management Controller (CMC). To provide RAID controller level High Availability, the dual Shared PowerEdge RAID Controller (PERC) 8 option can be used which work in active/passive mode. In this configuration, either of the two Shared PERC 8 can access the storage subsystem. If one Shared PERC 8 card fails, the other Shared PERC 8 card takes control in a seamless transition. Using CMC, virtual disks can be created and assigned to single or multiple server nodes (multiple if clustering-aware software is installed).The CMC web console can also be used to assign the PCIe slots to server nodes. Up to four PCIe slots can be assigned to a single server node. These mappings can be reassigned later, but the servers involved in the reassignment need to be power cycled.

Table 1 Overview of PowerEdge VRTX Infrastructure

Feature	**Description**
Server Compatibility	Dell PowerEdge M630/M830 servers
Form Factor	Stand-alone tower or 5U rack enclosure
Number of Servers	Up to 4 x M630 / 2 x M830
I/O	8 PCIe slots (supporting Ethernet, FC, GPU)
Power Supplies	Up to 4 PSUs (PSU and AC redundant options)
Chassis Storage	Up to 12 3.5-inch NL-SAS, SAS HDDs/SSDs or Up to 25 2.5-inch NL-SAS, SAS HDDs/SSDs
Raid Controller	Up to 2 Shared PowerEdge™ Raid Controller (PERC 8)
Management	1 or 2 Chassis Management Controllers
Network	1GbE pass-through module or 1GbE internal switch module (8 external ports)

For more information on Dell PowerEdge VRTX, see the Remote Office Infrastructure Reference Architecture on Dell PowerEdge VRTX using Microsoft Hyper-V 2012.

3.2 Overview of Hyper-V Reference Architecture with PowerEdge VRTX

Windows Server 2012 R2 Hyper-V increases operational efficiency by enabling server virtualization to make optimum use of server hardware. With Windows 2012 R2, Microsoft has introduced a significant number of improvements that allow customers to take advantage of newer server, storage and network hardware technologies.

This architecture aims to provide an efficient SMB infrastructure solution that reduces the management and support overheads by following the virtualized and shared infrastructure best practices that benefit enterprise-class business applications. The PowerEdge VRTX reference architecture is also designed to provide comprehensive design information about the core infrastructure services that are based on Windows Server 2012 R2.

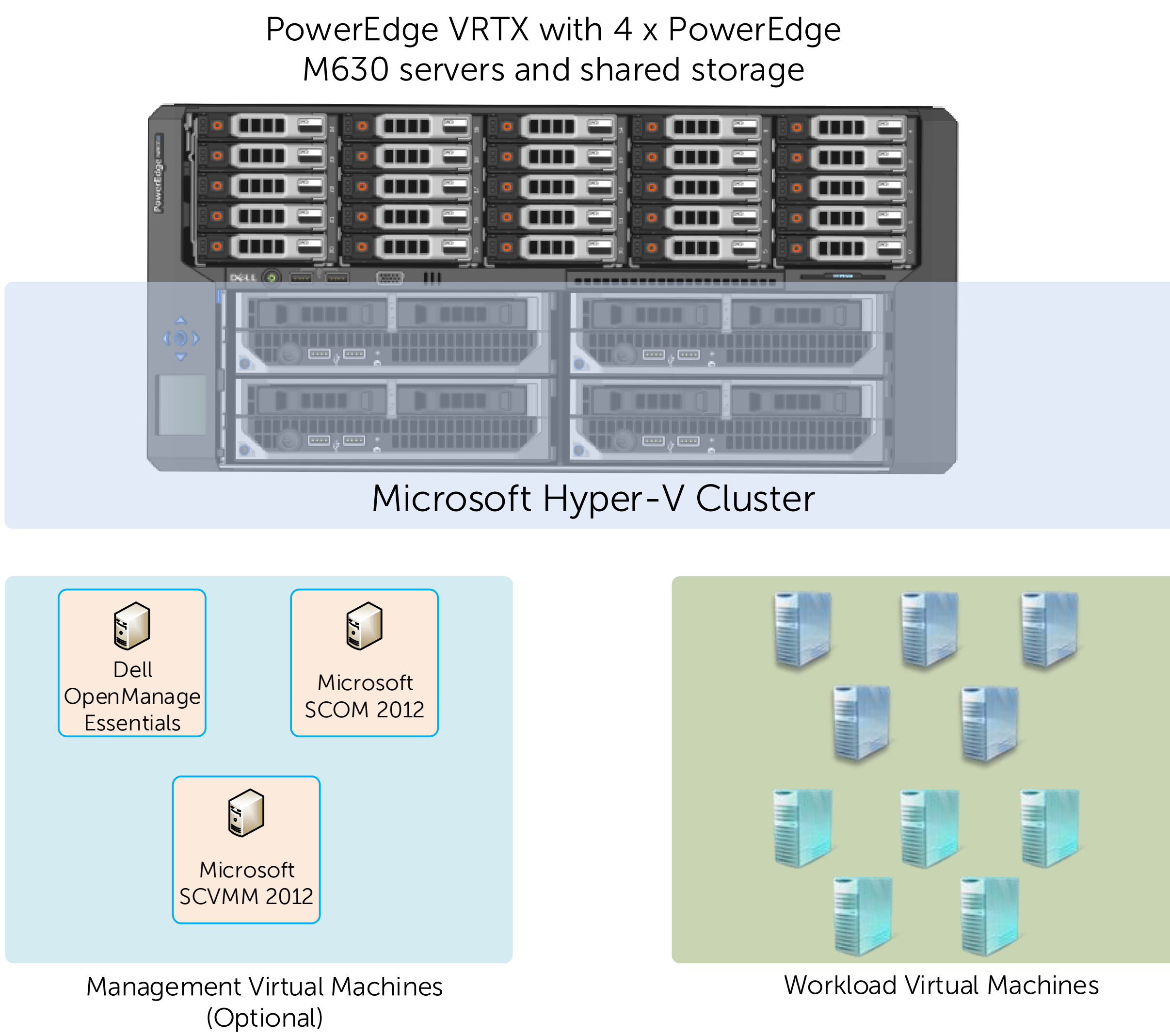

Figure 2 PowerEdge VRTX Hyper-V Cluster Architecture

Following are the key benefits of the PowerEdge VRTX reference architecture:

- Efficient application management and best practices achieved through hardware abstraction at various levels of the infrastructure, such as storage, network and server.
- Centralized management of the application ecosystem.
- Reduction in TCO.

This SMB office solution includes PowerEdge M630 servers running on the PowerEdge VRTX chassis hosting virtualized solution based on Microsoft (Hyper-V) with Dell Networking 1GbE or 10GbE switches as a network backbone and the PowerEdge VRTX internal shared storage as a storage area network (SAN). Table 2 lists the compute resources used in the PowerEdge VRTX reference architecture.

Table 2 Compute Resources in PowerEdge VRTX

Resource	Description
Compute Nodes	Up to 4 x PowerEdge M630
Processors	Up to 2 x Intel® E5-2600v3 Family processors in each M630 server
Memory	Up to 768 GB DDR4 memory in each M630 server

The following sections describe the features of the Hyper-V Reference Architecture with PowerEdge VRTX that benefit the UC&C deployment.

3.2.1 Storage Architecture and Configuration

The Hyper-V cluster in this reference architecture utilizes the storage virtual disk (VD) option. The reference architecture requires a minimum of two VDs for:

- The cluster Quorum configuration
- The cluster shared volume (CSV) for workload VM VHDXs

The PowerEdge VRTX chassis offers two options for disk configurations: 12 x 3.5-inch spindles and 25 x 2.5-inch spindles. This paper uses the latter option with 2.5-inch disks. In case of the PowerEdge VRTX chassis with 2.5-inch disks, disk 0 is used as the global hot spare (HS). The cluster Quorum VD and the VM Store CSV are created on RAID 10 VD along with the respective settings, as shown in Figure 3.

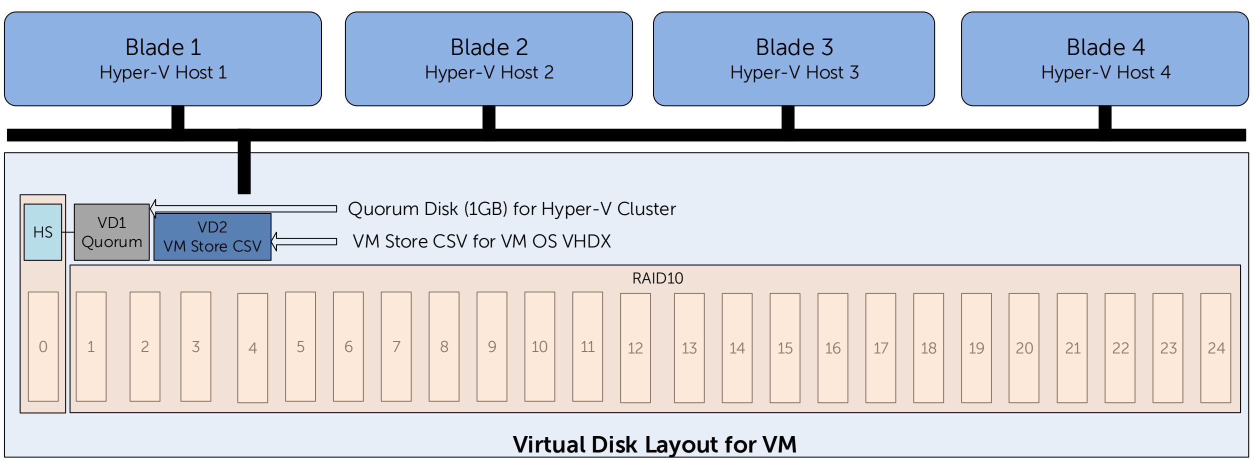

Figure 3 Virtual Disk Configuration on 2.5-inch PowerEdge VRTX Chassis

The remaining space in RAID 10 VD is available for storing workload-related data. However, to achieve appropriate isolation between the VM guest data store and application-specific data, multiple VDs can be created with appropriate RAID options.

3.2.2 Network Architecture and Configuration

The PowerEdge VRTX chassis offers two options for the network fabric: a pass-through module and an Ethernet switch module. To build HA, the host ports are mapped to the redundant Dell Networking 1GbE top-of-the-rack switches to support management, Live Migration and cluster interconnects traffic. The traffic types are logically separated using VLANs and QoS settings. The two switches are lagged together through an Inter-Switch Link (ISL) that provides a 20-Gb bandwidth between the two switches. The solution provides four 1-Gb uplinks from each switch to link into an existing core network infrastructure.

Each PowerEdge M630 server is configured with a Broadcom BCM57810 blade network daughter card (NDC), providing two 1GbE ports (as the Network Fabric A bandwidth supports only a 1-Gb network). There is another PCIe Network Broadcom BCM 5720 Dual Port adapter configured to provide additional bandwidth and HA for the Hyper-V cluster. All the four network ports (two ports from the network pass-through switch and two from the PCIe adapter) are connected to the redundant Dell Networking switches placed outside the PowerEdge VRTX enclosure, as shown in Figure 4.

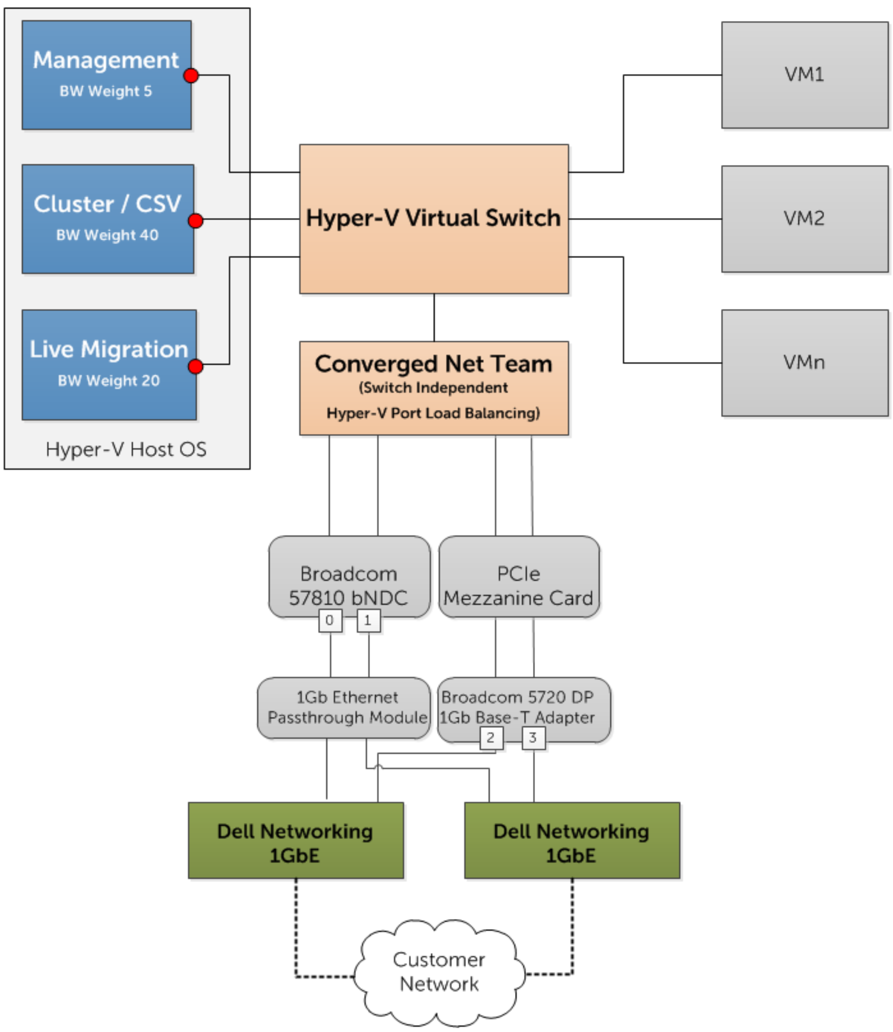

Figure 4 Logical Network Architecture for PowerEdge VRTX

On the Microsoft Hyper-V host, a converged network design using Microsoft NIC teaming is used to provide network connectivity to the application VMs, as shown in Figure 4.

3.3 Overview of the Dell DL4000

The Dell DL4000 is designed to safeguard the physical and virtual servers that power your business whether they are in your home or branch office, server room, or private cloud. Powered by Dell AppAssure software, DL4000 is a fully configured 1U backup appliance that integrates 5.5 TB (expandable up to 35.5 TB) of storage capacity with snapshot, replication, and deduplication and compression software to quickly recover applications and data.

DL4000 includes the following hardware and software:

- Dell DL4000 1U system
- PowerEdge RAID Controllers (PERC)
- Optional PowerVault MD1200 storage enclosure
- Preinstalled operating system and OpenManage™ system and storage management software
- AppAssure 5 software

Dell DL4000 is available in Standard and High-Capacity editions that scale up to 80 TB in backup storage capacity with higher processing, memory and networking power. See the Dell DL4000 Owner's Manual at dell.com/support/manuals for details about each configuration.

As shown in Figure 5, the appliance operating system resides on a RAID 1 (mirrored) virtual disk created by using the first two lower capacity drives. The AppAssure backup repository resides on a RAID 6 auto-provisioned virtual disk separate from the rest of the higher capacity drives.

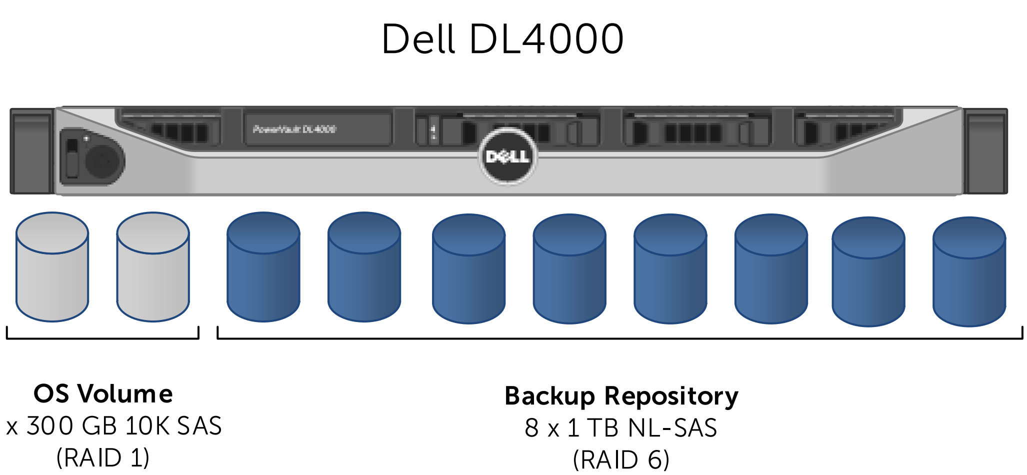

Figure 5 Dell DL4000 Overview

As mentioned earlier, the Dell DL4000 appliance offers capacity expansion up to 80 TB with the PowerVault MD1200 storage enclosure attached to the DL4000 system externally.

For more information on Dell DL4000 expansion configurations, see the DL4000 Appliance Deployment Guide.

3.3.1 AppAssure 5.0 Feature Overview

Dell DL4000 is preinstalled and configured to run AppAssure 5.0 backup and recovery software. AppAssure 5.0 offers unified data protection by combining backup, replication and recovery in a single solution that is engineered to be the fastest and most reliable backup for protecting VMs and physical machines.

AppAssure 5.0 provides application awareness to ensure reliable application data recovery from your backups. AppAssure 5 is built on the new, patent-pending True Scale™ architecture, which delivers fast backup performance with aggressive, near-zero recovery time objectives (RTOs) and recovery point objectives (RPOs).

AppAssure 5 combines the following unique and innovative technologies:

- **Live Recovery:** Instant recovery technology provides near-continuous access to data volumes on virtual or physical servers.
- **Recovery Assure:** Provides recoverability of applications (file systems, Microsoft Exchange/SQL) and backups in virtual and physical environments and features a comprehensive integrity-checking algorithm that identifies data corruption early and prevents corrupted data blocks from being maintained or transferred during the backup process.
- **Universal Recovery:** Provides unlimited machine restoration flexibility—physical-to-virtual (P2V), virtual-to-virtual (V2V), virtual-to-physical (V2P), physical-to-physical (P2P)—and performs bare metal restores to dissimilar hardware.
- **True Global Deduplication:** Reduces physical disk capacity requirements through inline block-level compression and deduplication along with forever incremental block-level backups.

Dell offers additional software that can provide individual object-level granular recovery for Exchange and SharePoint. Dell MailRetriever and Dell Recovery Manager for Exchange can be used for granular recovery of individual e-mails. Similarly, Dell DocRetriever and Dell Recovery Manager for SharePoint can be used for single item recovery.

DL4000 is licensed to have up to two local continuous VM exports that can export up to two machines to the Hyper-V server resident on DL4000 for a very quick RTO. For instance, if the exchange service is compromised due to software or hardware failure, and if its VM is configured to export continuously, it can be started on the Hyper-V server on DL4000 in seconds.

4 Solution Architecture

A high-level diagram of the reference architecture is illustrated in Figure 6. It shows a converged virtualization platform for business applications. The solution considers the business needs of SMB and translates the requirements into a robust, virtualized solution that adheres to all the best practices such as high availability, application best practices, performance and business continuity etc.

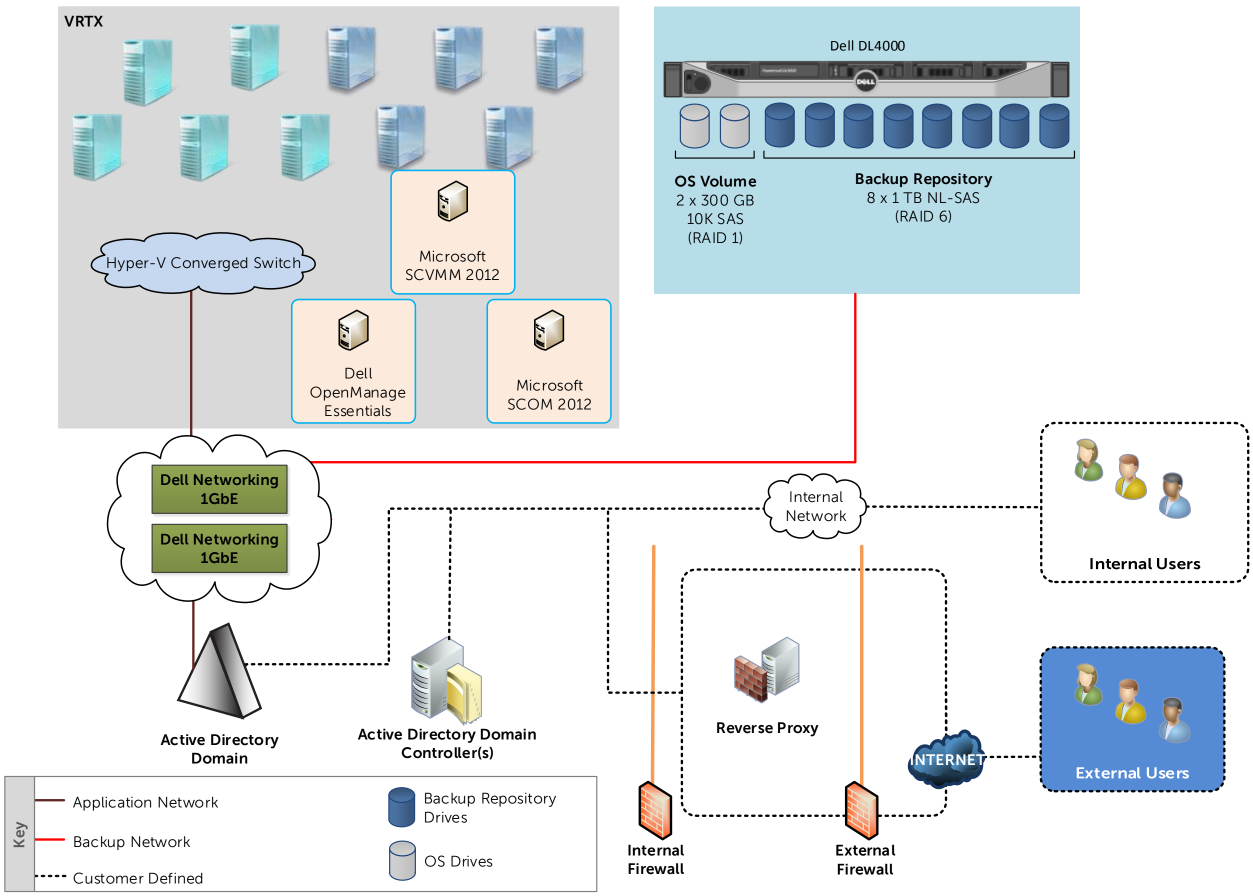

Figure 6 Logical view of Datacenter

To design a robust solution, we considered specific design principles for every layer of the infrastructure. The following sections describe the design principles for virtualized infrastructure.

4.1 Key Design Considerations

The Hyper-V reference architecture for PowerEdge VRTX is built on a number of key design principles, such as infrastructure HA, virtualization and networking best practices. However, the following additional principles must be considered to deploy and configure any business application on PowerEdge VRTX:

- High Availability
- Application best practices and performance
- Hardware abstraction

- Resource consolidation
- Application data protection

4.1.1 High Availability

HA is critical to ensure minimal business downtime. Installing the application correctly and ensuring that the application's performance remains above appropriate thresholds is necessary for the business to function properly. As mentioned in Section 2.1 our sample implementation is office environment and our assumption is that these customers have different requirements. This paper focuses on the following two layers of HA:

- Infrastructure availability is provided by PowerEdge VRTX to ensure that when a hardware component fails, there is another server, network path, storage drive, etc. to provide the same resource.
- Hypervisor availability migrate application VMs on other hosts upon host hardware failure.

If a compute node in the infrastructure fails, the VMs are automatically moved to other available physical hosts. While infrastructure and hypervisor availability ensure that the application's services do not get impacted by the infrastructure failure, the shared storage in PowerEdge VRTX and the RAID implementation ensure that the application data is highly available.

> This reference implementation considers PowerEdge VRTX as a shared infrastructure platform with HA built at the infrastructure components, including HA for the VMs provided by the hypervisor.

4.1.2 Application Best Practices and Performance

While maintaining HA is critical, applications must also ensure a good end-user experience. The following application best practices help prevent performance bottlenecks:

- Don not use dynamic memory for memory-intensive application.
- Maintain virtual CPU to physical core ratio at 1:1 for CPU-intensive applications. Otherwise follow application best practices.
- Allow no coexistent of critical application services on the same host.
- Use dedicated hard drive spindles for certain applications if it is specified as a best practice for that application. Fixed VHDX instead of pass-through disk mapping is recommended for optimal performance and ease of management for applications that require external storage for data.

4.1.3 Hardware Abstraction

Abstracting specific hardware from the application services reduces complexity and ensures that the application is load-balanced across the entire cluster. Applications can be decoupled from their underlying hardware as long as best practices from the infrastructure and application layer are followed.

To abstract hardware, a virtual cluster with VM failover and performance load balancing must be used. VM failover allows the application VMs to be moved around from server to server within the cluster for maintenance or in the event of server failure. However, certain application VMs cannot coexist with other application VMs for performance reasons. In such cases, rules can be created so that certain VMs do not coexist on the same physical server with other VMs.

4.1.4 Resource Consolidation

While running a solution that combines many application servers on the same infrastructure, resources can be consolidated to reduce the overall hardware needed. Some examples of resource consolidation are:

- Shared SQL servers can be used by applications to reduce resource requirements and application footprint.
- A single virtualized cluster allows VMs to reside on the same shared storage array, reducing hardware resource costs.
- Sharing storage for application data also reduces costs as long as application best practices and performance requirements are met.

4.1.5 Application Data Protection

While infrastructure HA ensures that the application services are available, it is equally important to protect the data stored in these applications. Each enterprise application has a specific backup and recovery mechanism and also a set of design considerations.

4.1.5.1 Application Aware Data Protection

A few applications follow the native backup and recovery methods that use Volume Shadow Copy Service (VSS). These native methods support application-aware backup and recovery. Application awareness ensures that the in-place recovery features of the application data are available to the application administrators. In-place recovery features provide faster recovery for both VMs and application data. With in-place recovery, there is no need to restore an entire backup set.

4.1.5.2 Dedicated Backup Network Connections

It is recommended to separate the backup network from the application workload network to ensure that the backup network traffic does not impact application performance. However, the in-band management network (where there is no workload traffic) on each of the application VMs has the lowest network traffic during normal operation and is best suited for sharing the management network bandwidth with a backup network.

4.1.5.3 Network Connection Teaming and Switch Redundancy

To provide sufficient bandwidth for backup and recovery operations and enable fault-tolerance for network connections, it is recommended that the network connections on the backup appliance are teamed and connected through redundant network switches.

4.2 Benefits at Infrastructure Level

As mentioned earlier, PowerEdge VRTX provides a shared, virtualized infrastructure for deploying business applications. Apart from sharing the underlying physical infrastructure, the PowerEdge VRTX shared infrastructure complements the application deployment by providing benefits at the infrastructure level.

The Hyper-V Reference Architecture is built based on virtualization best practices. The following are the benefits at the infrastructure level:

- Provides an infrastructure that enables the key tenets of virtualization, such as Live Migration and hypervisor HA.
- Abstracts specific hardware details, such as the physical host and the storage location. This enables the application virtual machines to move from one host to another in a failover scenario, simplifying maintenance and administration.
- Performs infrastructure lifecycle management, such as firmware updates or memory increases, seamlessly by moving application VMs to other hosts in the PowerEdge VRTX infrastructure.

Configuring applications correctly helps IT to achieve these benefits from PowerEdge VRTX while adhering to application best practices and ensuring a high-quality end-user experience.

Typically, these applications are run in silos, preventing a consolidated view of how these applications are performing. By deploying applications on a single infrastructure, administrators can quickly debug software, view performance metrics and manage the hardware for the applications. This benefit is exemplified by the Chassis Management Controller (CMC) console, where an administrator can manage the compute, storage and networking fabric used by the applications.

5 Solution Specifications

This section details the solution specifications for all of the components that make up this reference architecture and are part of the solution.

Table 3 Solution specification details

Component	Details	
Solution ID	**5632620**	
Servers	1 x Dell PowerEdge VRTX with 4 x M630	
	Processor	2 x Intel Xeon E5-2660v3 Family with 10 Cores
	Memory	128 GB; 8 x 16GB DDR4 DIMMs
	HDD	2 x 300GB 10K SAS in RAID 1
	Network	Broadcom 57810 blade NDC 1 x Broadcom BCM 5720 Dual Port adapter (PCIe)
	OS	Windows Server 2012 R2 Datacenter Edition
Storage	VRTX Shared Storage with 25 x 1.2 TB 10K SAS drives	
Networking	2 x Dell Networking S60 switches	
Backup Appliance	Dell DL 4000	

This reference architecture comprises Windows Server 2012 R2 Hyper-V on PowerEdge VRTX converged infrastructure, Dell Networking S60 top-of-the rack switches and Dell Dl 4000 backup appliance. It incorporates DellStar Solution ID 5632620, which provides a complete list of the infrastructure components used in the design (See table above.) The DellStar configuration can be customized to fit specific customer needs. Because some of the components in the DellStar Solution ID configuration may have been upgraded or changed over time, the solution ID is provided as a quick reference, but is not to be treated as the final bill of materials.

6 Protecting Applications with Dell DL4000

As explained in the preceding sections, one of the design goals of this reference architecture is to provide uninterrupted application services to the end user.

HA of the physical hosts (PowerEdge M630 servers) within PowerEdge VRTX is achieved through Hyper-V cluster service configured to provide seamless application VM migrations across different physical hosts within PowerEdge VRTX. The physical disk-level redundancy is achieved by configuring RAID volumes across the physical hosts' internal hard disks as well as across the PowerEdge VRTX shared storage.

Additionally, in this reference implementation, Dell DL4000 running the AppAssure data protection software is deployed to protect the application data. AppAssure protects application VMs from corruptions at OS, application or data volume level.

6.1 AppAssure Application Aware Backup and Restore

When installed and configured on each of the application VMs, AppAssure agent enables complete recoverability of the whole VM; that is, it restores host operating system, system state, installed applications, application configurations and application data.

One of the prime features of AppAssure is application-aware backup and recovery for enterprise applications such as Exchange and SQL. Application aware agents check the Exchange and SQL metadata to identify database and logs locations and tie those volumes together as a single Protection Group so that AppAssure can snap them simultaneously. The AppAssure agents installed on other application VMs treat them as a generic VM-level backup without requiring any specific application-level configurations.

In the event of operating system or application corruption, in-place rollback restores can be performed to restore the application VM to a previous point-in-time state. Similarly, in the event of application-data-only corruption, a single volume or multiple volumes containing application data can be restored. An application-aware AppAssure agent for Exchange and SQL allows seamless in-place recovery without requiring manual shutdown of respective services.

6.2 Backup Configuration Recommendations

After AppAssure Agent is installed on the application VMs, the auto backup policy by default takes snapshots at 60-minute intervals. However, depending on the application workload performance requirements and the RPOs of your business, the snapshot frequency can be adjusted for each protected application VM.
If it is required to retain backup snapshots for longer periods of time, the retention periods can be changed. Global deduplication and continuous incremental block-level backup reduce the overall disk space requirements for backup retentions. If needed, AppAssure backup repository expansion to PowerVault MD1200 storage is considered for additional backup storage space.

AppAssure can be configured to perform mountability checks on Exchange and SQL databases after every snapshot. This corruption detection feature alerts administrators of potential failures and ensures that all data on the Exchange and SQL servers will be recovered successfully in the event of a failure.

The following Exchange and SQL server settings can be enabled depending on your organization's specific requirements:

Exchange Settings:

- Automatic mountability check
- Nightly checksum check
- Nightly log truncation

SQL Settings:

- Nightly attachability check
- Nightly log truncation

To conduct SQL attachability checks, you will need a SQL CAL (Client Access License) on Dell DL4000.

If you are protecting your AD/DC/DNS server in addition to all application VMs using Dell DL4000, set "Maximum Concurrent Transfers" to at least one more than the number of hosts being backed up.

6.3 Backup Architecture with Dell DL4000

Dell DL4000 is a part of this overall solution architecture. Apart from application-aware backup and in-place recovery mechanisms, the design goals for application data protection include network isolation or separation of backup network, network teaming and switch redundancy for failover and optimal backup performance of the appliance.

Dell DL4000 has four 1 GbE Broadcom ports. It is recommended that these ports be teamed together using Broadcom Advanced Configuration Suite. This provides a much bigger network pipe for backup load, in addition to network interface redundancy. Additionally, the use of two Dell Networking switches provides redundancy for the backup network by connecting two of the Dell DL4000 LOM ports to each switch, as shown in Figure 7.

Additional 4 x 1 GbE Intel add-on NIC ports on Dell DL4000 can be teamed together to handle replication or stand-by application traffic.

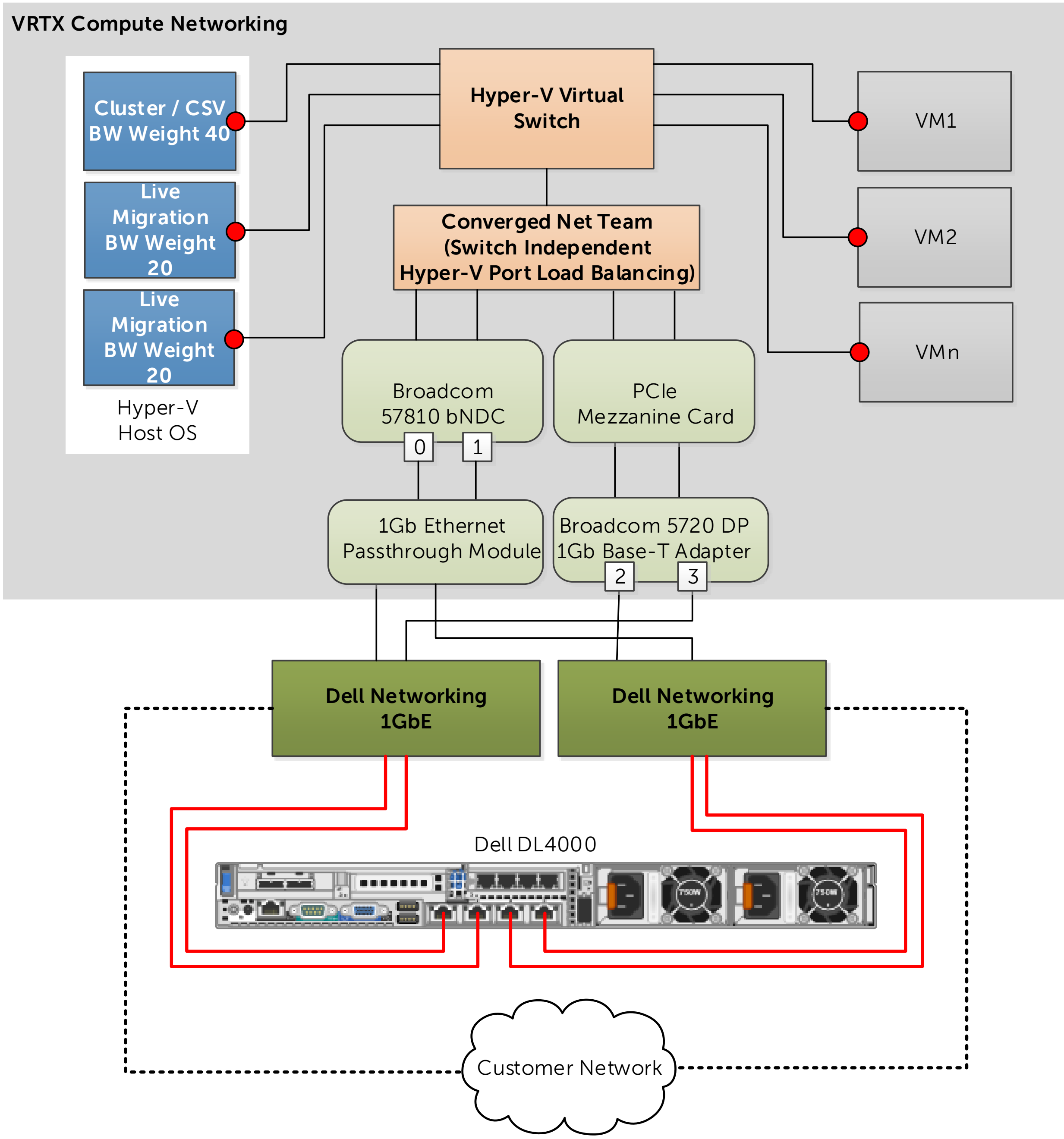

Figure 7 Backup Network Architecture with PowerVault DL4000

AppAssure has inbuilt data deduplication/compression, and its continuous incremental synthetic backup mechanism generates less backup traffic.

7 Solution Summary

The Dell PowerEdge VRTX shared infrastructure platform resolves the complexities involved in managing infrastructure for application deployments and enables IT administrators to combine servers, storage and networking into an easy-to-deploy chassis. Potential errors are reduced with the use of unified and simplified systems management.

The design goals, as described in Section 4.1 will add to the solution requirements to supply a list of resources used to meet all of the requirements. The recommended solution architecture described in Section 4 takes into account the best practices specified by Dell and Microsoft. The design points emphasize the use of the latest hardware and software features presented in PowerEdge VRTX to enable application consolidation, hardware abstraction and infrastructure HA. The infrastructure HA features ensure that the application services are continuously available and deliver optimal performance.

The shared storage architecture is simple to configure and manage using the Chassis Management Controller (CMC) interfaces. Creating multiple virtual disks for VM and application data achieves both data isolation and optimal performance.

The converged virtual switch used for the VM network access enables high quality-of-service (QoS) for different classes of traffic and ensures that the demands for network bandwidth are met. Hence, the bandwidth requirements for VM Live Migration and cluster traffic are given priority, when needed, to enable seamless movement of VMs during optimization and/or planned downtime of the hypervisor hosts.

To fully abstract the application VMs from their physical hosts, VMs must be placed dynamically. VMs must also be load balanced across servers depending upon their workload type and their relationship to other VMs. To achieve server load balancing, the cluster should be configured with SCVMM Dynamic Optimization (DO) to automatically live migrate VMs to less utilized hosts. SCVMM availability sets should be used to ensure that the VMs with similar application roles or high resource requirements do not coexist on the same hypervisor host.

The Dell DL4000 data protection appliance protects the VM and application data. The features such as application-aware backups, in-place recovery and the ease of deployment and configuration make DL4000 the right choice for protecting the application data.

A Additional Resources

1. **Support.dell.com** is focused on meeting customer requirements with proven services.
2. **DellTechCenter.com** is an IT Community where you can connect with Dell Customers and Dell employees for the purpose of sharing knowledge, best practices and information about Dell products and installations.
3. Referenced or recommended Dell publications:
    a. Dell PowerEdge VRTX
    b. Microsoft Windows Server 2012 Hyper-V Reference Architecture for Dell PowerEdge VRTX
    c. Dell DL4000 Product Manual
    d. Dell AppAssure Documentation
    e. Dell AppAssure Product Demos
    f. Deploy Microsoft UC&C applications on PowerEdge VRTX
4. Referenced or recommended Microsoft publications:
    a. Configuring Dynamic Optimization in VMM
    b. Configure Availability Sets in VMM