

Discover Storage Spaces Direct in Windows Server 2019 with Dell EMC Ready Solutions

Webcast – December 18, 4:00PM – 4:45PM

Steve McMaster, Dell EMC Global Sales Enablement Microsoft Solutions
Cosmos Darwin, Senior PM, Microsoft Core OS Engineering

DELLTechnologies

Hyper-Converged Infrastructure powered by Windows Server



Cosmos Darwin
Senior PM, Core OS Engineering



@cosmosdarwin

**There is a revolution happening
in the server market.**

Why Hyperconverged Infrastructure is so Hot

BY YEVGENIY SVERDLIK ON DECEMBER 10, 2015

42



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LAS VEGAS – Hyperconverged infrastructure did a concept two or three years ago. Today, it is on

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Why Hyperconverged Infrastructure is Gaining in Popularity

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ANALYSIS

Hyperconvergen

Systems that combine compute, st
among CIOs seeking the same effi



By Clint Boulton

Senior Writer, CIO | JAN 24, 2017 11:02 AM

CIOReview

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Vendors 2016

The Need for Hyperconverged Infrastructure in Today's Business Environment

By CIOReview | Wednesday, April 19, 2017

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The growing scale of operations and complexity always in

+78.1% HCI Growth YoY

- IDC Worldwide Converged Systems Report, Q2 2018

“HCI drove second quarter market expansion [...]”

- IDC Worldwide Converged Systems Report, Q2 2018

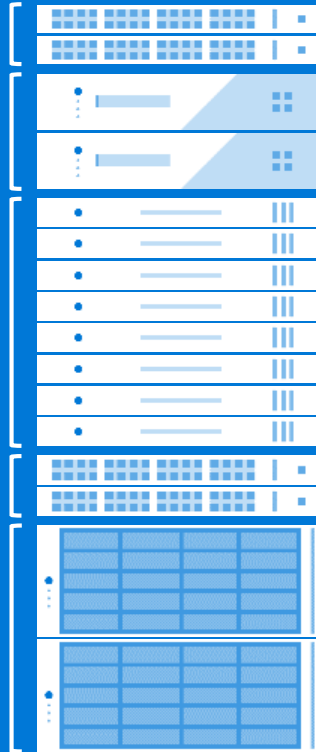
Ethernet Switches

Misc. Appliances

Hypervisors

Storage Fabric

Storage (SAN)



Traditional “Three Tier” Infrastructure

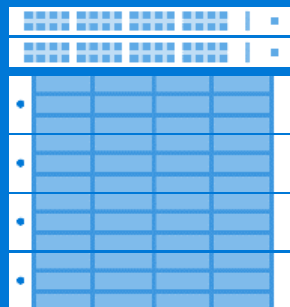
Ethernet Switches

Misc. Appliances

Hypervisors

Storage Fabric

Storage (SAN)



Ethernet Switches

Standard x86 servers

+

Local drives

+

The magic of software

Traditional "Three Tier" Infrastructure

Hyper-Converged Infrastructure (HCI)

Everything you need, one familiar product



Hyper-V

Introduced in 2008, ten years ago!
Foundation of our hyperscale Azure cloud



Storage Spaces Direct

Introduced in Windows Server 2016
Foundation of Azure Stack



SDN

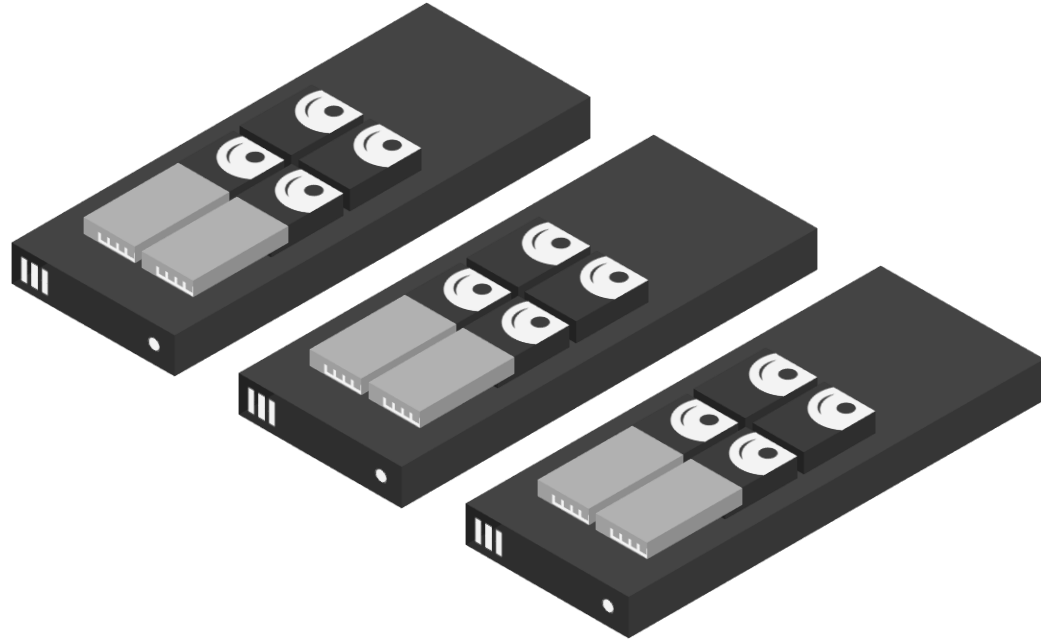
Introduced in Windows Server 2016
Foundation of Azure Stack

Included in Windows Server 2016/2019

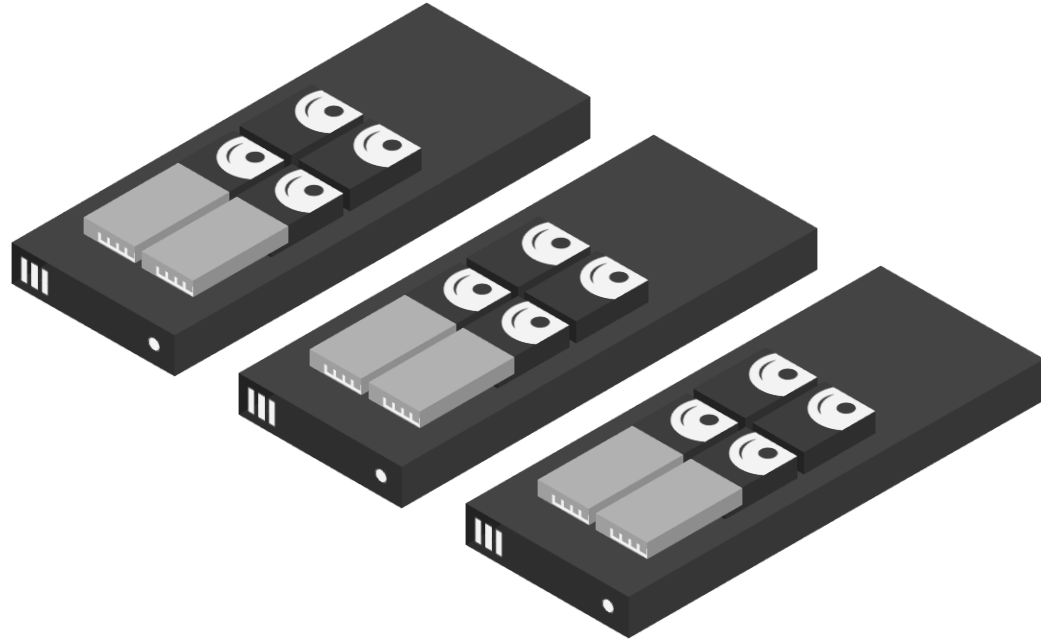
- ✓ Hypervisor / compute
- ✓ Software-defined storage
- ✓ Software-defined networking
- ✓ Management software
- ✓ Unlimited guest licenses

Source: <https://www.microsoft.com/cloud-platform/windows-server-pricing>

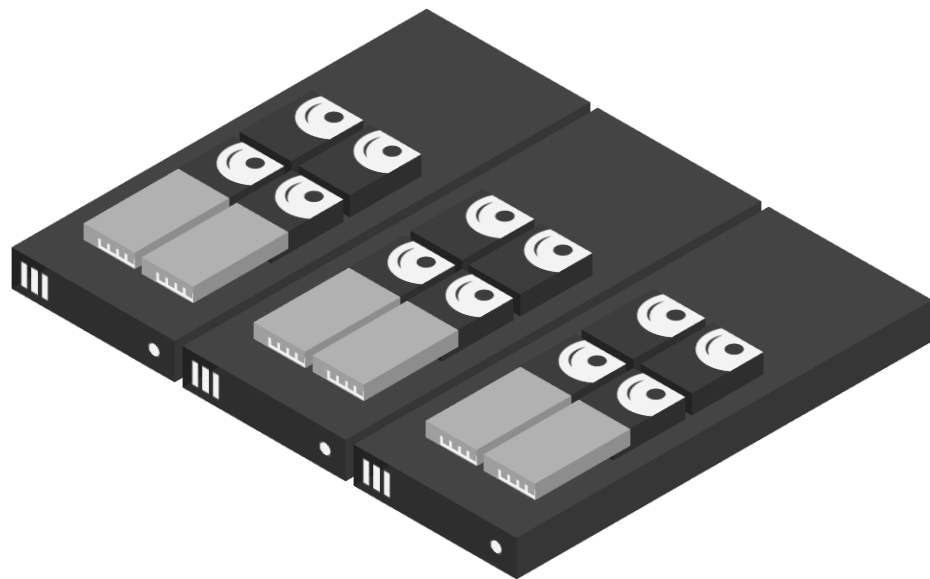
How Storage Spaces Direct works



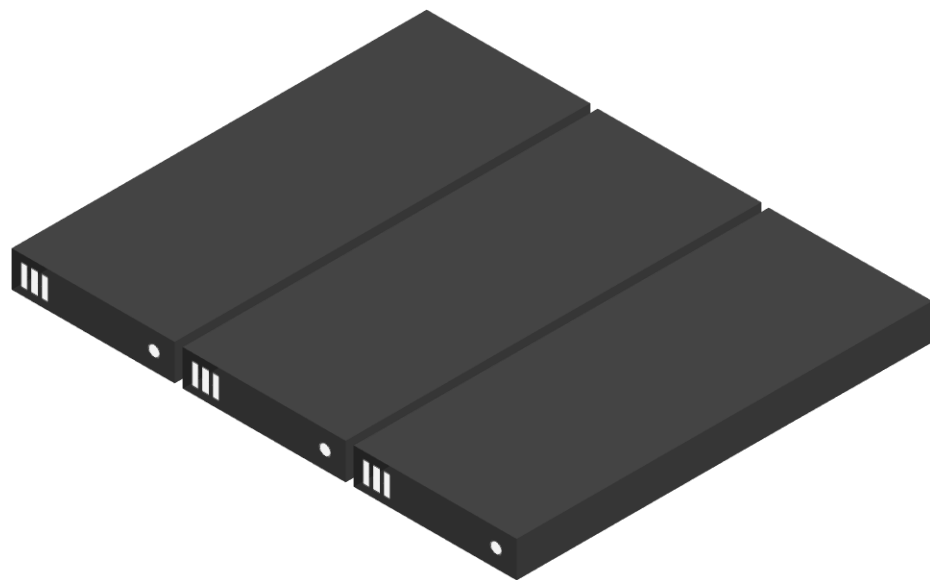
Industry-standard servers with internal drives

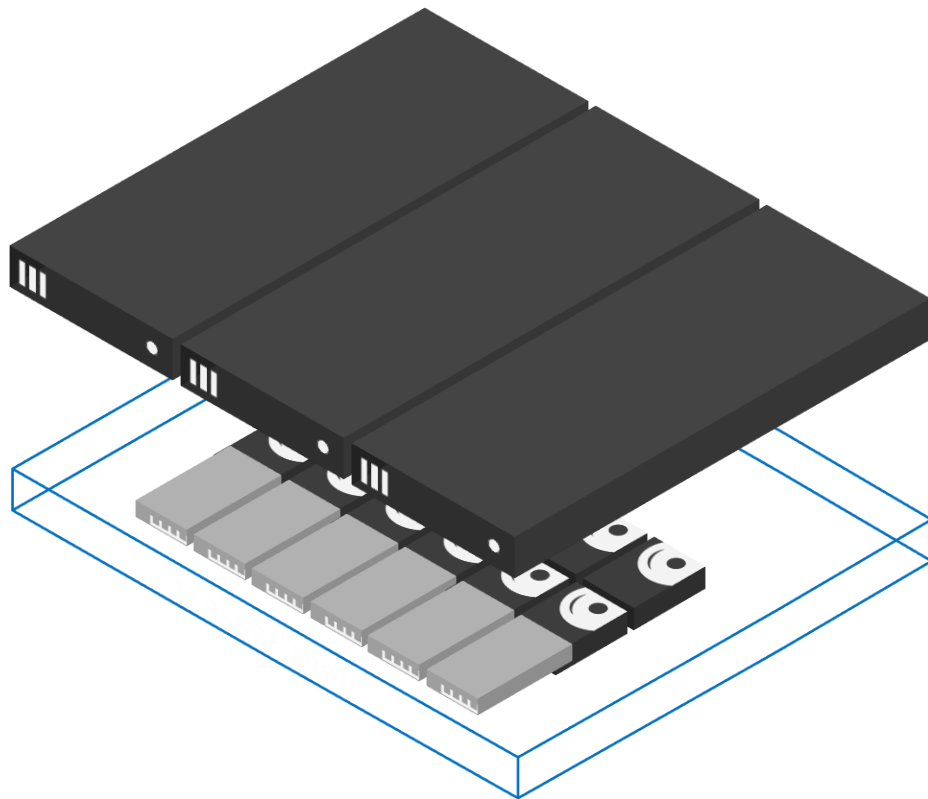


No shared storage, no fancy cables – just Ethernet

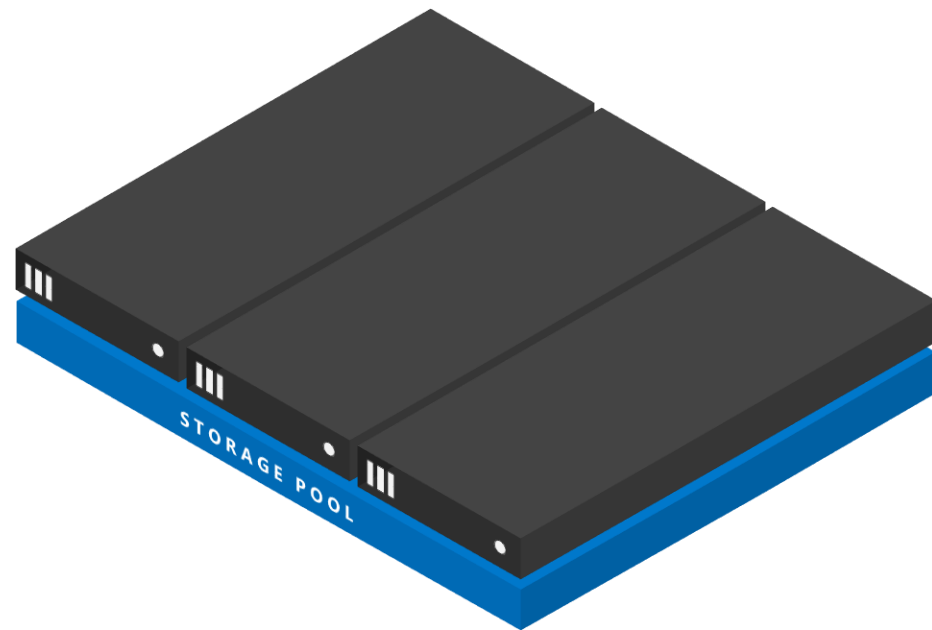


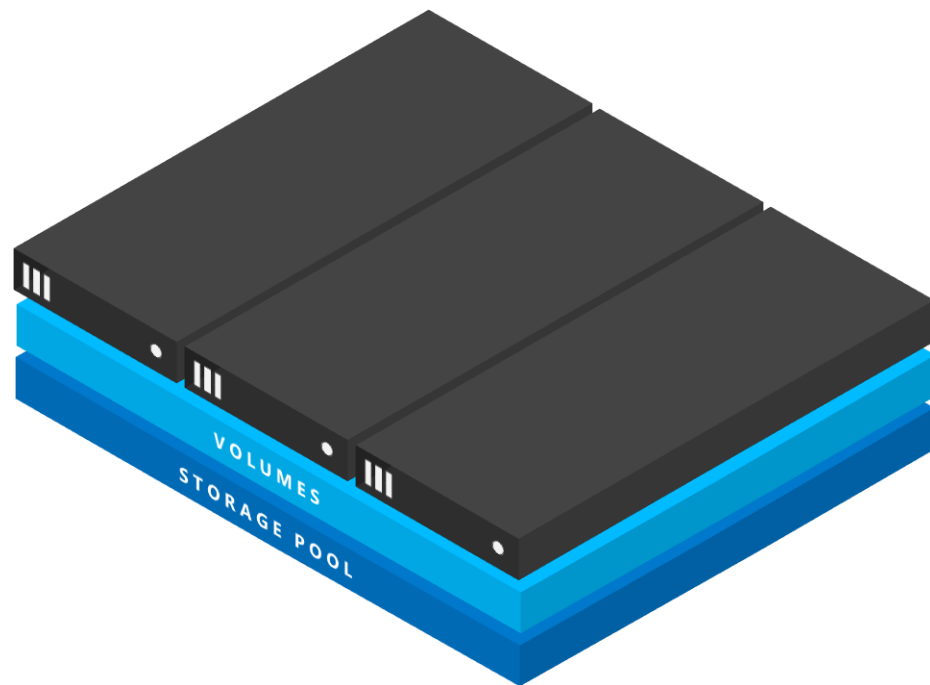
Create cluster



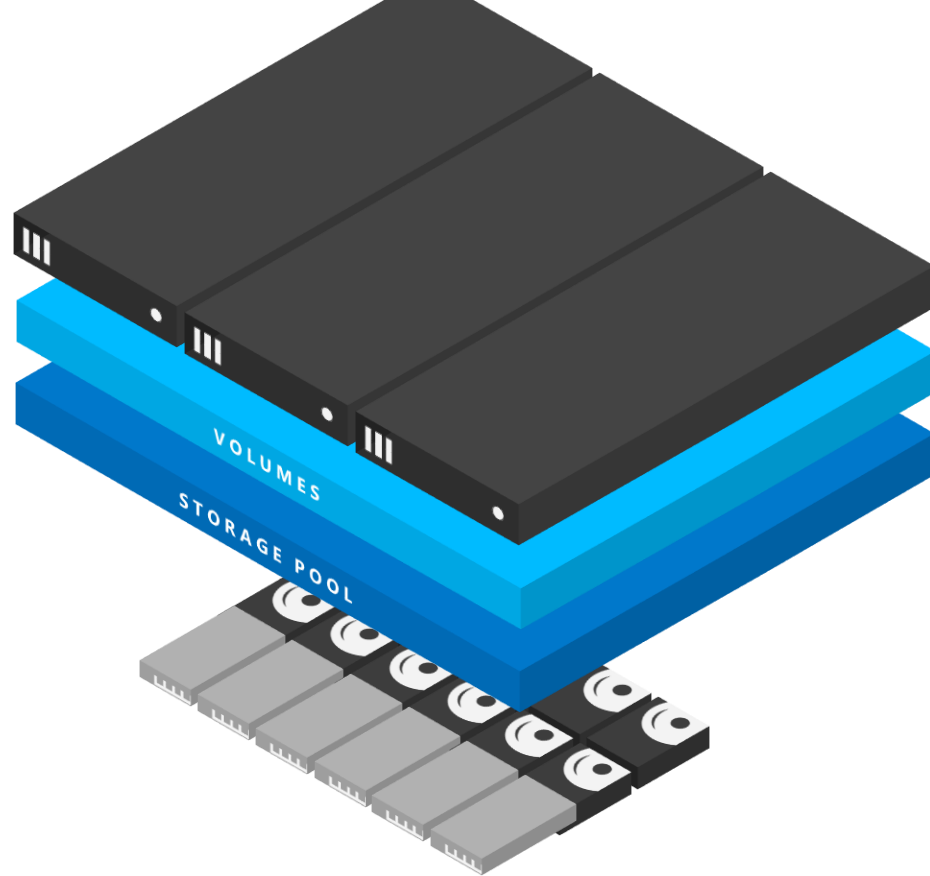


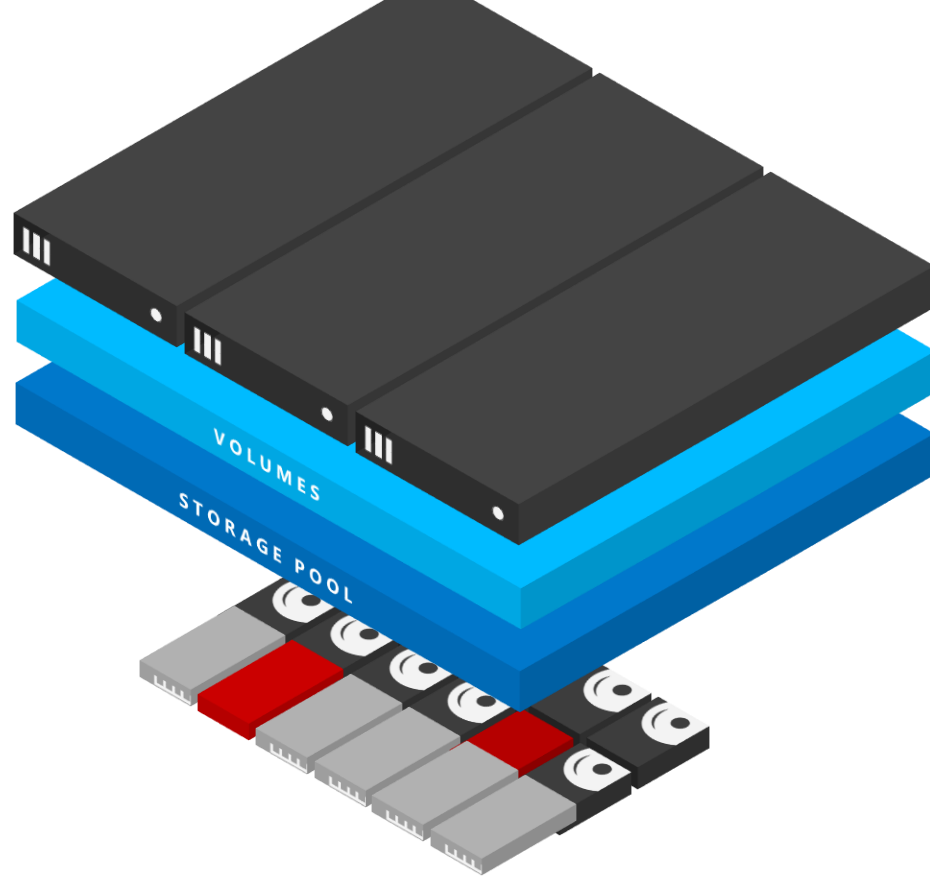
Software-defined “pool” of storage



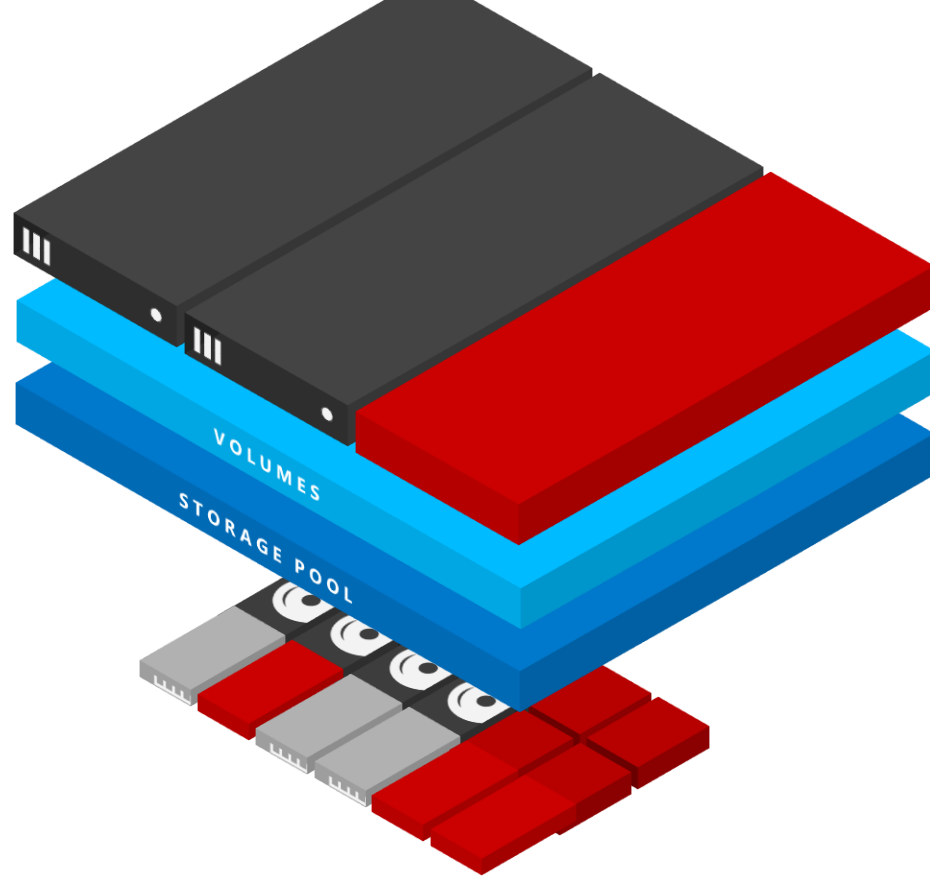


Create volumes

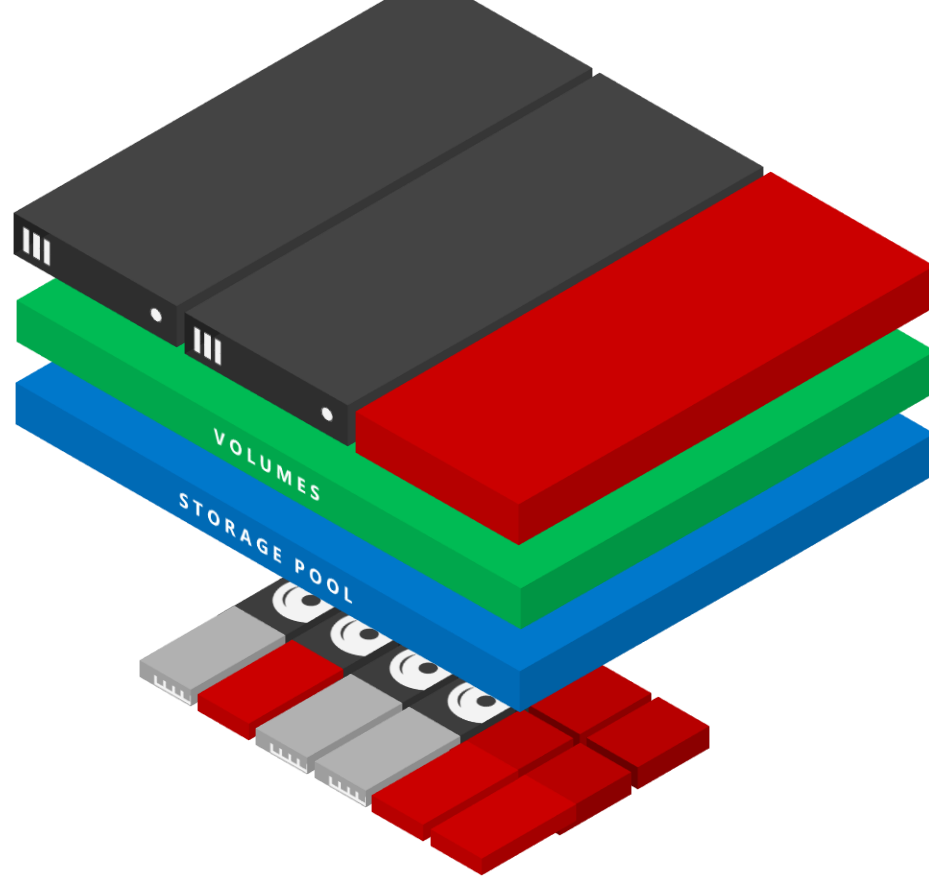




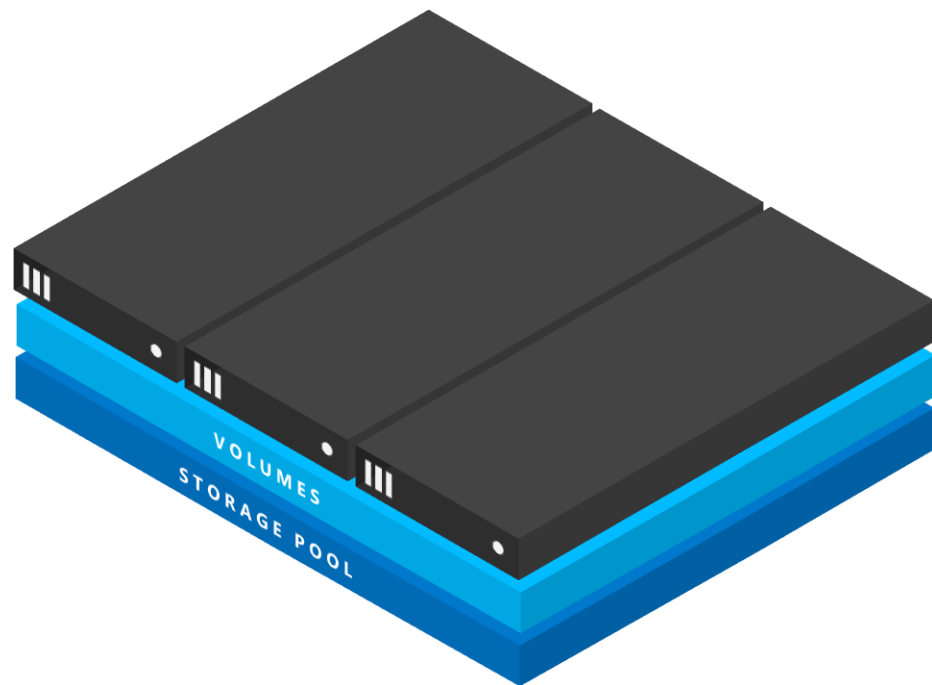
If drives fail

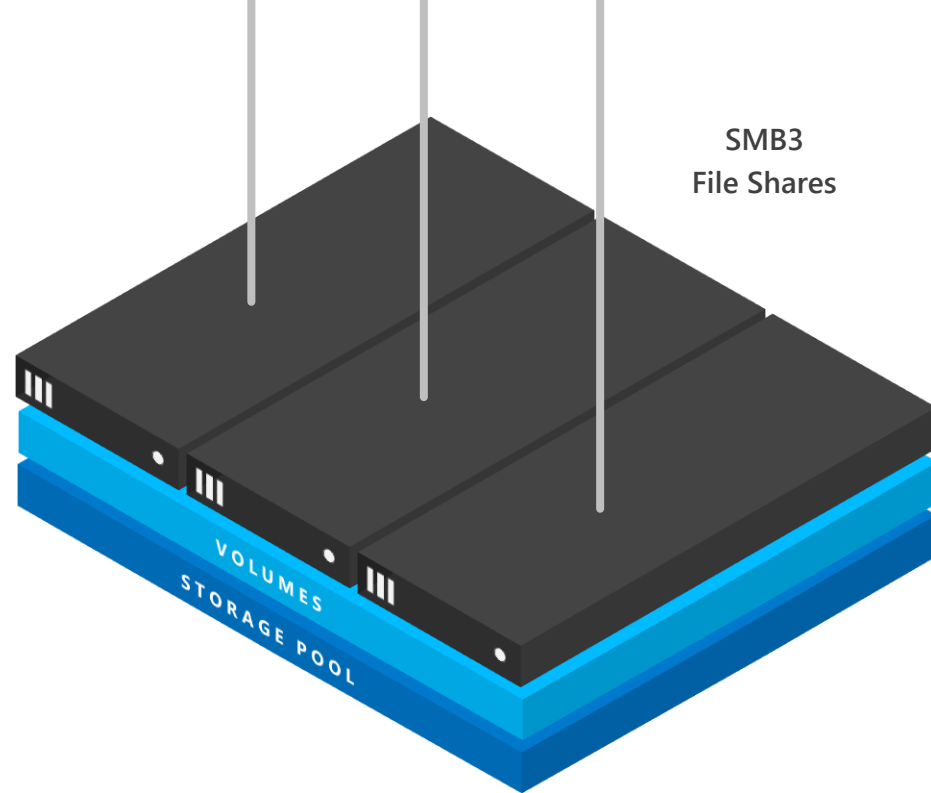


Even if servers go down



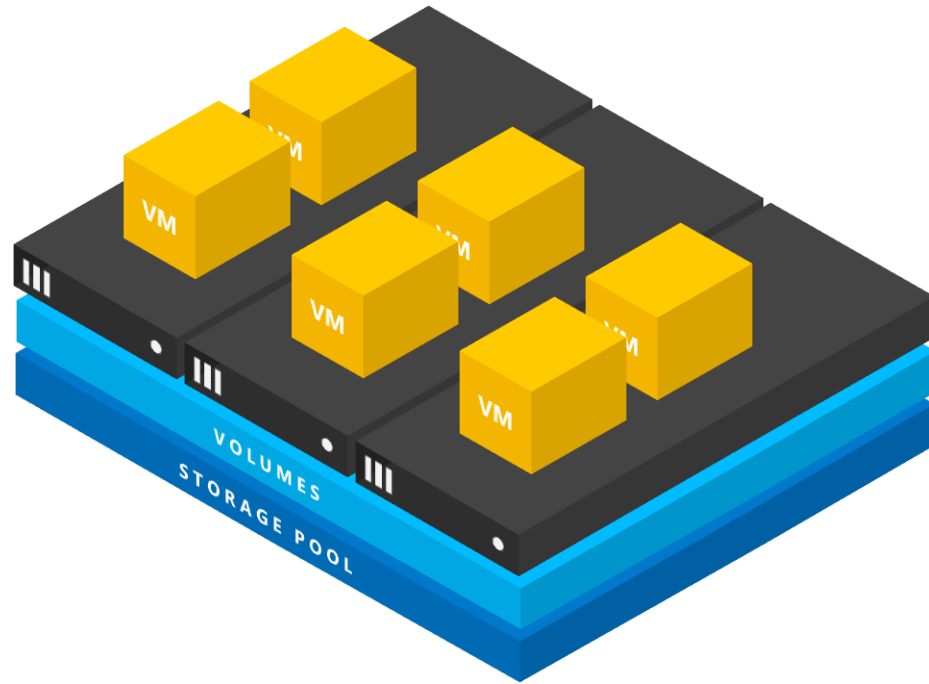
All data stays online and accessible





SMB3
File Shares

Scale-Out File Server (SoFS)



Hyper-Converged Infrastructure (HCI)

Enterprise-grade software-defined storage

Fault Tolerance

- ✓ Drive / server / network fault tolerance
- ✓ Optional rack and chassis awareness
- ✓ Storage replication for BC/DR (sync or async)
- ✓ High and continuous availability

Software RAID

- ✓ Two- and three-way mirror (RAID-1)
- ✓ Dual parity / erasure coding (RAID-6)
- ✓ Mirror-accelerated parity
- ✓ Nested resiliency
- ✓ Striping (RAID-0)
- ✓ Single parity (RAID-5)
- ✓ S.M.A.R.T. predictive drive failure
- ✓ Drive latency outlier detection
- ✓ Automatic repair and resync

Software Checksum

- ✓ File integrity checksum
- ✓ Automatic in-line corruption correction
- ✓ Proactive file integrity scrubber

Encryption

- ✓ Data-at-rest (BitLocker)
- ✓ Data-in-transit (SMB Encryption)

Efficiency

- ✓ Kernel-embedded architecture
- ✓ Remote direct memory access (RDMA)
- ✓ Data deduplication
- ✓ Compression

Performance

- ✓ In-memory cache
- ✓ Persistent read/write cache
- ✓ Real-time tiering
- ✓ Hybrid and all-flash support
- ✓ Persistent memory / NVDIMM support
- ✓ Intel® Optane™ PMEM support
- ✓ NVMe, SATA, SAS support
- ✓ Instant VHD creation / expansion
- ✓ Instant VHD checkpoint management

Scale

- ✓ Petabyte scale
- ✓ Scale-up and scale-out
- ✓ Proactive storage balancing
- ✓ From 2 to 16 servers
- ✓ From 8 to 400+ drives
- ✓ Cloud Witness for quorum
- ✓ Dynamic quorum

Flexibility

- ✓ Hyper-converged infrastructure (Hyper-V)
- ✓ Scale-Out File Server (SoFS)
- ✓ Native SQL Server

Management

- ✓ Built-In failure and capacity alerting
- ✓ Built-In performance history
- ✓ Per-VM Quality of Service (QoS) IOPS limits
- ✓ 100% scripting-friendly (PowerShell)
- ✓ System Center Integration

Product of the year – Software-Defined Storage



*"most useful, well-crafted
and innovative"*

Winner
Storage Spaces Direct

Increase performance

INDUSTRY-LEADING

6, 6 9 6, 5 4 2

Monday, September 26, 2016 | 16 server nodes running Windows Server 2016



NEW IOPS RECORD

1 3 , 7 9 8 , 6 7 4

Monday, September 24, 2018 | Windows Server 2019 with Intel® Optane™ DC persistent memory



Windows Server is on the leading edge



NVMe

Full support for M.2, U.2,
Add-In-Card (AIC)



Intel Xeon® Scalable®

Supported since announcement
on Windows Server 2016+



RDMA

Unique to Windows
software-defined storage



Intel Thunderbolt™ 3

Blazing the trail for
switchless networking



3D XPoint

Supported since announcement
on Windows Server 2016+



Persistent memory

Use as cache or capacity in
Windows Server 2019

of x86 hardware innovation

<https://blogs.technet.microsoft.com/filecab/2018/10/30/windows-server-2019-and-intel-optane-dc-persistent-memory/>

Server & Tools Blogs » Server & Management Blogs » Storage at Microsoft

All About
Windows Server

Cloud Platform
Blogs

Datacenter
Management

Client
Management

Virtualization, VDI
& Remote Desktop

File & Storage &
High Availability

Windows
Server

Storage at Microsoft

The official blog of the Windows and Windows Server storage engineering teams

The new HCI industry record: 13.7 million IOPS with Windows Server 2019 and Intel® Optane™ DC persistent memory

★★★★★

October 30, 2018 by Cosmos Darwin 0 Comments

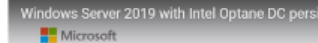
Share 4/ 0 0

Written by Cosmos Darwin, Senior PM on the Core OS team at Microsoft



Hyper-converged infrastructure is an important shift in datacenter architecture built on industry-standard interconnects, x86 servers, faster and more affordably than ever before.

Watch this demo from Microsoft Ignite 2018:



Demo – Windows Server with Intel® Optane™ DC persistent memory

Software

Windows OS. Every server node runs Windows Server 2019 Datacenter pre-release build 17765, the latest available on September 20, 2018. The power plan is set to High Performance, and all other settings are default, including applying relevant side-channel mitigations. (Specifically, mitigations for Spectre v1 and Meltdown are applied.)

Storage Spaces Direct. Best practice is to create one or two data volumes per server node, so we create 12 volumes with fileFS. Each volume is 8 TiB, for about 100 TiB of total usable storage. Each volume uses three-way mirror resiliency, with allocation delimited to three servers. All other settings, like columns and interleaves, are default. To accurately measure IOPS to persistent storage only, the in-memory CSV read cache is disabled.

Hyper-V VMs. Ordinarily we'd create one virtual processor per physical core. For example, with 2 sockets x 28 cores we'd assign up to 56 virtual processors per server node. In this case, to saturate performance took 26 virtual machines x 4 virtual processors each = 104 virtual processors. That's 312 total Hyper-V Gen 2 VMs across the 12 server nodes. Each VM runs Windows and is assigned 4 GiB of memory.

VHDXs. Every VM is assigned one fixed 40 GiB VHDX where it reads and writes to one 10 GiB test file. For the best performance, every VM runs on the server node that owns the volume where its VHDX file is stored. The total active working set, accounting for three-way mirror resiliency, is 512 x 10 GiB x 3 = 9.58 TiB, which fits comfortably within the Intel® Optane™ DC persistent memory.

Benchmark

There are many ways to measure storage performance, depending on the application. For example, you can measure the rate of data transfer (GB/s) by simply copying files, although this isn't the best methodology. For databases, you can measure transactions per second (TPS). In virtualization and hyper-converged infrastructure, it's standard to count storage input/output (I/O) operations per second, or "IOPS" – essentially, the number of reads or writes that virtual machines can perform.

More precisely, we know that Hyper-V virtual machines typically perform random 4 KiB block-aligned I/O, so that's our benchmark of choice.

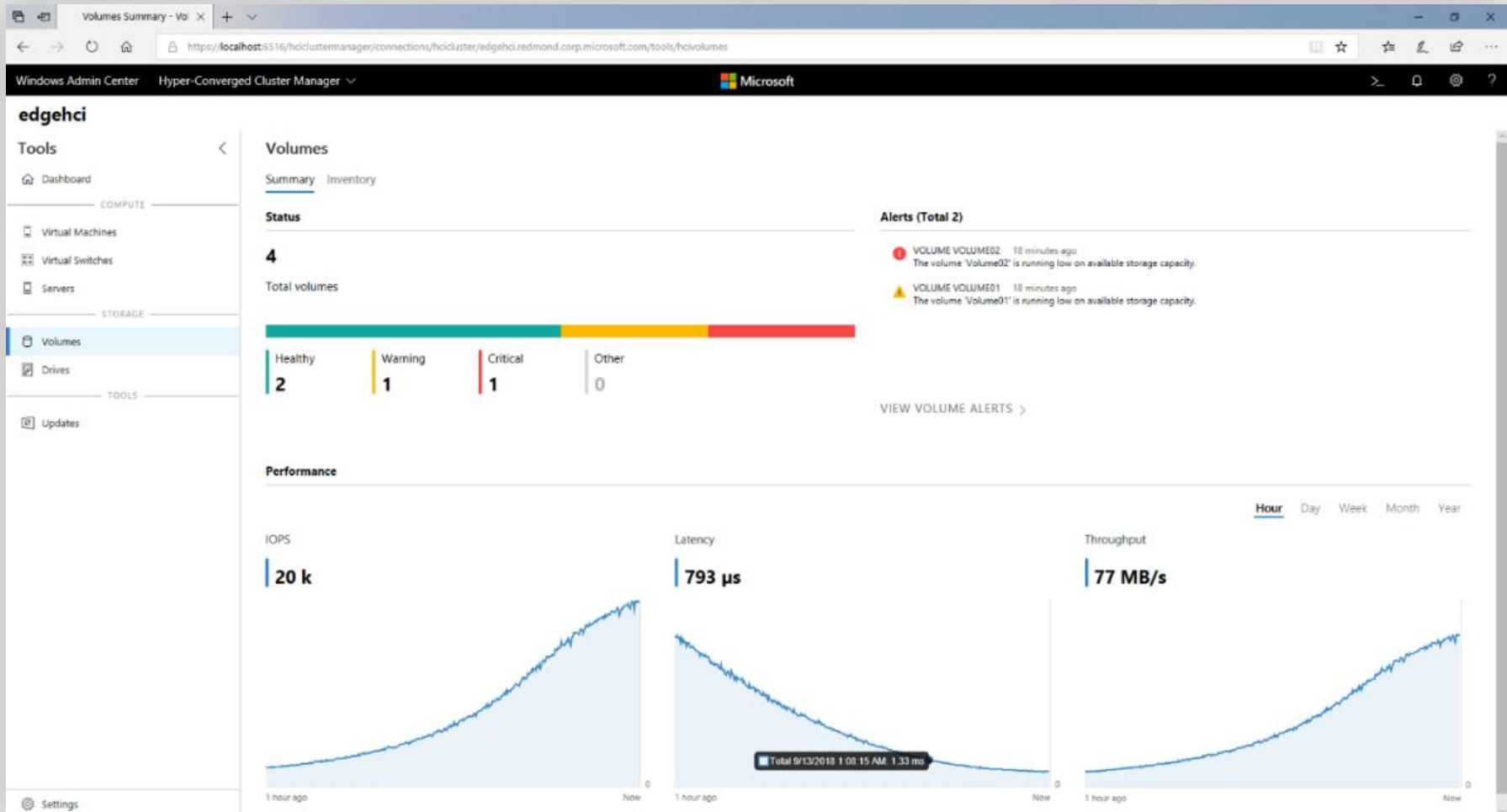
How do you generate 4 KiB random IOPS?

- **VM Fleet.** We use the open-source VM Fleet tool available on GitHub. VM Fleet makes it easy to orchestrate running DISKSPD, the popular Windows micro-benchmark tool, in hundreds or thousands of Hyper-V virtual machines at once, to saturate performance, we specify 4 threads per file (-t4) with 16 outstanding I/Os per thread (-o16). To skip the Windows cache manager, we specify unbuffered I/O (-Su). And we specify random (-r) and 4 KiB block-aligned (-b4k). We can vary the read/write mix by the -w parameter.

In summary, here's how DISKSPD is being invoked:

```
.\diskspd.exe -d120 -t4 -o16 -Su -r -b4k -w0 [...]
```

Simplify management



Windows Admin Center for HCI

Q: How long does it take to download and install?

A: **Under 5 minutes.**

Q: How much does it cost?

A: **No cost beyond your Windows licenses.**


Q: Does it have dependencies, e.g. SQL Server, System Center?

A: **No.**

Q: Does it require an Internet connection?

A: **No.**

WATCH THE DEMO



Microsoft Ignite

Orlando, FL
September 24-28, 2018


Why cache writes?

Coalescence
Random IO is hard for an HDD. Squeeze up to 5x more writes by coalescing them in software to minimize arm movement and use every platter rotation effectively.


Absorb bursts
Writes may not happen uniformly over time. Absorb spikes over quieter periods to keep drives working steadily.

Just write once
Apps may overwrite data multiple times in rapid succession. Reduce overall traffic to HDD by only writing the "last" version.

Bursty, random, and possibly repetitive IO from apps / virtual machines



Optimized "trickle" de-stage from cache to capacity



Session BRK2231 from Microsoft Ignite 2018
<https://www.youtube.com/watch?v=5kaUiW3qo30>



Get all the software you need, included in Windows.



Get amazing storage performance.



Get unified management for VMs and storage.

10,000

Clusters of Storage Spaces Direct

As of March 27, 2018

The figure cited is the number of currently active clusters reporting anonymized census-level telemetry, excluding internal Microsoft deployments and those that are obviously not production, such as clusters that exist for less than 7 days (e.g. demo environments) or single-node Azure Stack Development Kits. Clusters which cannot or do not report telemetry are also not included.

+50%

In just the last 6 months

As of September 14, 2018

The figure cited is the number of currently active clusters reporting anonymized census-level telemetry, excluding internal Microsoft deployments and those that are obviously not production, such as clusters that exist for less than 7 days (e.g. demo environments) or single-node Azure Stack Development Kits. Clusters which cannot or do not report telemetry are also not included.

Create



Mead&Hunt

Bradley

de stroomlijn

EVGA



MAKE IT



Acuutech



Microsoft.com/HCI


Microsoft | Windows Server | Comparison | Pricing | Solutions | Previous versions | Try Windows Server

Hyper-converged infrastructure from Windows Server

Accelerate your business with hyper-converged infrastructure. Bring the latest cloud-inspired innovation to your datacenter using software-defined compute, storage, and networking technology from Microsoft and your choice of hardware certified for the Windows Server Software-Defined program.


[Download the datasheet](#)

What you'll love about the Windows Server Software-Defined program




Hybrid capabilities

Take advantage of the cloud and on-premises scaling together with the only hyper-converged infrastructure platform from a leader in public cloud.




Industry leading performance

Achieve unprecedented virtual machine performance with millions of IOPS and consistent sub-millisecond latency.




Lower costs

Consolidate with industry-standard hardware and enjoy the flexibility to buy what you need today and seamlessly scale out tomorrow.



Simpler operations

Easily manage and monitor your infrastructure with the included dashboard and native PowerShell automation.



Enterprise-grade security

Help keep apps and data secure with advanced virtual machines, network micro-segmentation, and native encryption for data at rest and in transit.

Contact a partner about offers available for your datacenter

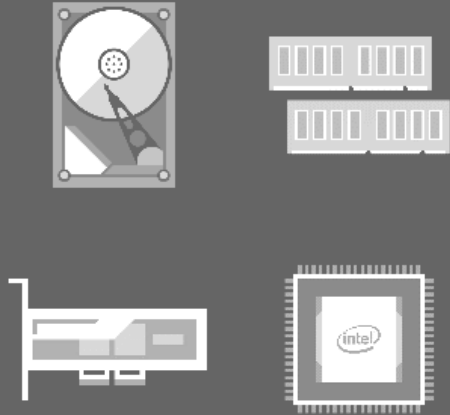
Filter by Solution Type: Filter by Configuration Type: Filter by Partner:

[Clear filter](#)

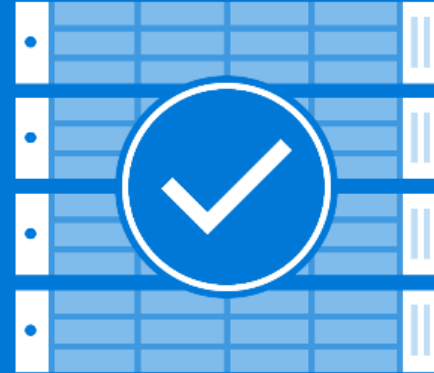
Results (53)

| Solution type | Configuration type | Feature | Available name | Solution details |
|-------------------------|--------------------|---------|----------------------|----------------------------|
| Premium Hyper-converged | Enterprise | Disk | PowerEdge R730xd H8 | Learn more |
| Premium Hyper-converged | Enterprise | API | ProLiant DL380 Gen10 | Learn more |
| Premium Hyper-converged | Enterprise | Disk | PowerEdge R730xd H8 | Learn more |
| Premium Hyper-converged | Enterprise | Laptop | ThinkSystem S8300 | Learn more |

Two ways to buy Windows Server HCI



Build your own
with SDDC AQ'd components



Partner offers
Validated and ready-to-go



Storage Spaces Direct Ready Nodes

for Windows Server 2016
AVAILABLE TODAY

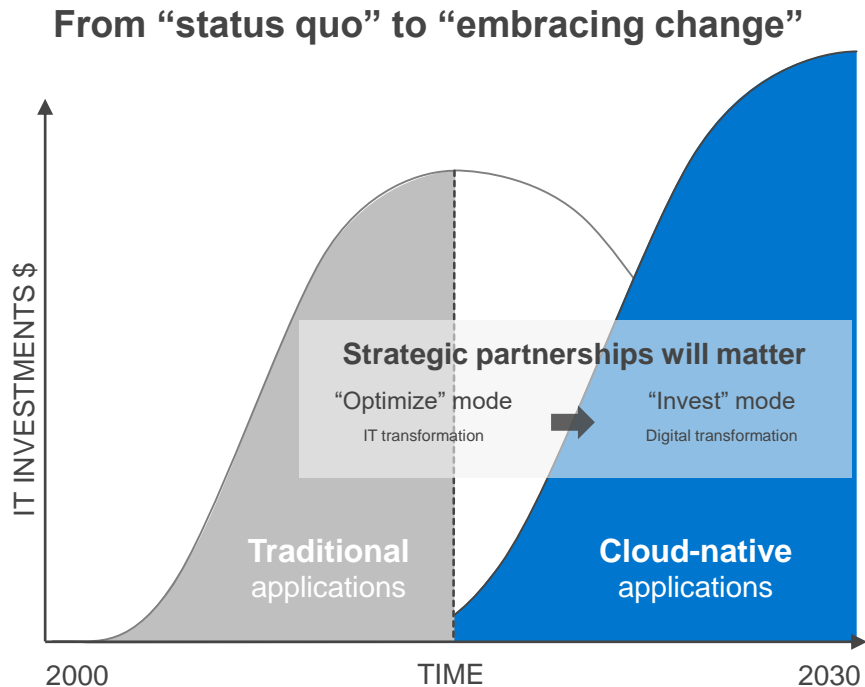
for Windows Server 2019
COMING IN FEBRUARY

Dell EMC Microsoft Storage Spaces Direct Ready Nodes

Stephen McMaster
Dell EMC Ready Solutions

DELLTechnologies

Digital transformation is a balancing act



Technology will move from the realm of IT to become inherent across the business

Last 15 years

Next 15 years

IT-centric

Business-centric

Systems of record

Systems of engagement
and insight

Traditional applications

Cloud-native apps

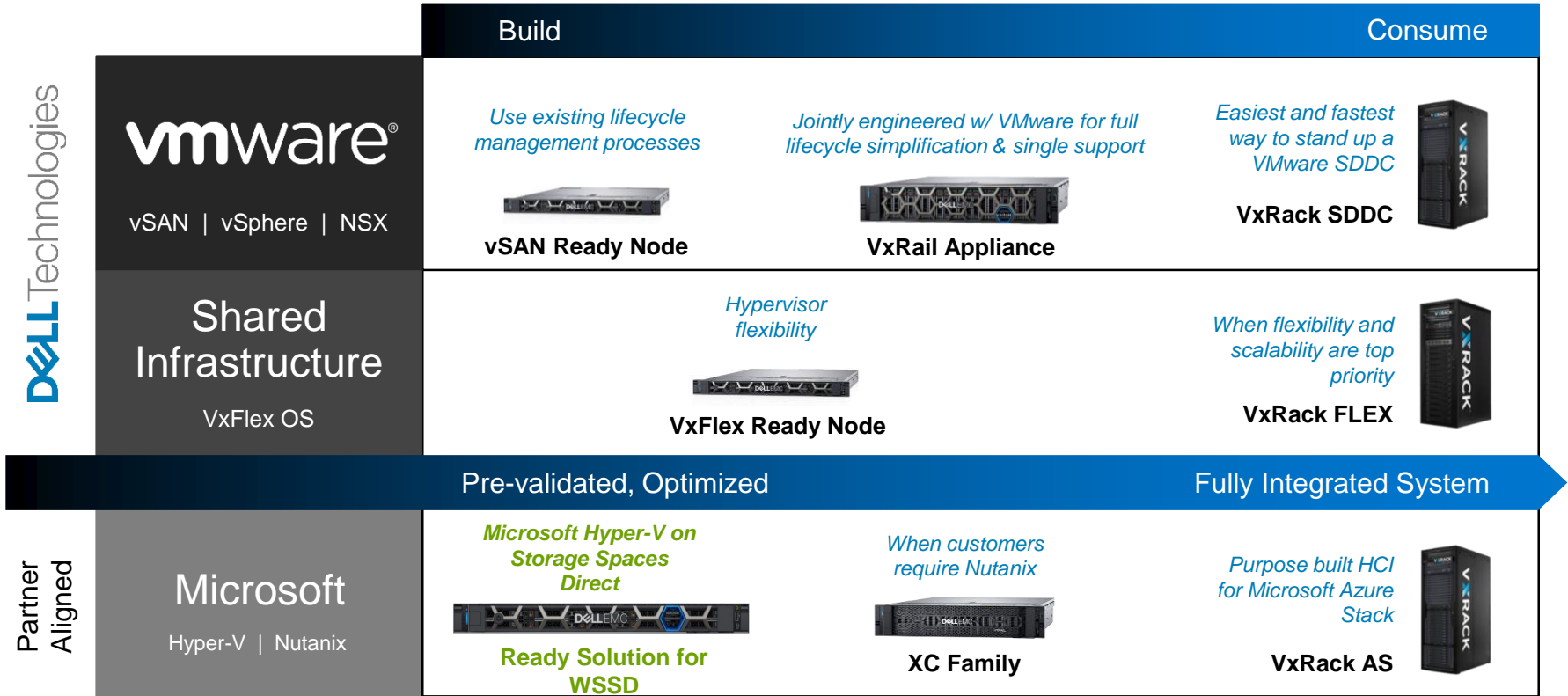
Transactional data
and reporting

Streams of data and
analytics

Internet

Internet of Everything

Dell EMC HCI Portfolio – Where does WSSD Fit?



Are you unlocking the value of Windows Server Software-Defined (WSSD)?

Designing and configuring **new infrastructure** for is complex.

It is difficult to avoid guesswork when building software-defined clusters

It takes a long time to **design, configure, test, and validate** hardware

Multiple interfaces, additional steps to complete tasks and increased need for specialized knowledge drains resources

With virtualization, it can be **hard to locate the source of a problem**, making it hard to know who to call for help.

When you have an issue, there's no time to stop and figure out if the source is related to hardware or software

Dell EMC Ready Solution for WSSD



S2D Ready Nodes are pre-configured, validated and certified server nodes designed to run Microsoft WSSD to deploy a Microsoft Hyper-Converged Infrastructure solution

Dell EMC Ready Solution for Microsoft WSSD:

- S2D Ready Nodes on R640, R740xd
- PowerEdge certified R440 server
- Dell EMC 10GbE/25GbE networking
- Dell ProSupport and ProSupport Plus
- Dell ProDeploy and ProDeploy Plus

Benefits

- 1 **Confidence** — WSSD certified components take the guesswork out of building HCI clusters
- 2 **Convenience** — Pre-configured solutions make sales and acquisition very convenient
- 3 **Customer support** — Customers enjoy the simplicity of a solution that's supported globally by Dell EMC for streamlined, collaborative support from the first call

Dell EMC Ready Solutions for Microsoft WSSD

There are 15 configuration options:

- Two Hybrid Configurations
- One All Flash Configuration
- Four NVMe Configurations
- Two Hybrid Configuration
- Two All Flash Configuration
- Two ROBO Configurations (All Flash and Hybrid)
- One Hybrid Configuration
- One All Flash Configuration



R740xd Storage Spaces Direct RN



R640 Storage Spaces Direct RN



R440 PowerEdge

Please see the [Solution Overview](#) for detailed configuration options

WSSD solutions platforms

| Platform | R440 WSSD Certified Server | R640 S2D RN | R740xd S2D RN | R740xd2 S2D RN (coming in CY19Q1) |
|---------------------------|--|---|--|---|
| Positioning | Cost and performance optimized 1U form factor HCI solution | Performance and Density optimized 1U form factor HCI solution | Performance and storage optimized 2U form factor HCI solution | Capacity Optimized 2U platform for maximum internal storage |
| Targeted customer profile | Edge/ROBO/SMB and space (depth) constrained locations | Small to Medium businesses looking for balance of performance, cost and density | Medium/Large businesses looking for storage dense configurations | Medium/Large businesses looking for high capacity HCI solution for Tier 2/Tier 3/Backup/Archive workloads |



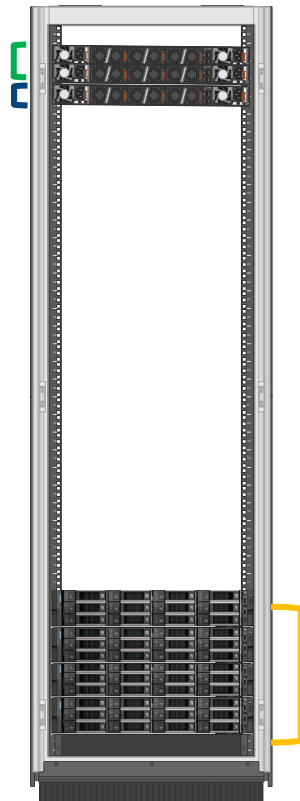
WSSD Solution Scalability

2 x S4048/S4112/S41x8/S5048 (TOR)
1 x S3048 (OOB)



Storage Spaces Direct RN as a
hyper-converged building block

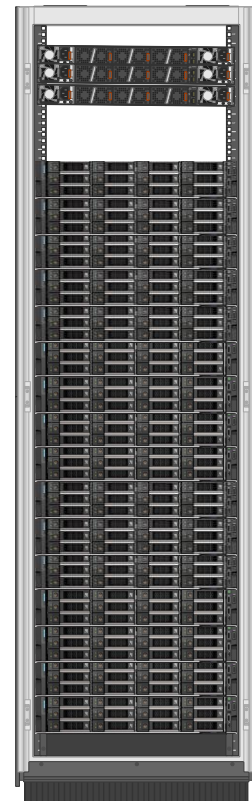
- Compute and Storage hyper-converged
- Scalable building block
- Storage and Network fabrics converged
- RoCE with DCB enabled on switches for configurations with Mellanox Cards
- iWARP based network configuration with Qlogic card
- Converged or separated networking supported



Dell EMC completed WSSD
Certification and will provide
support for 16 node clusters



4 x 2U or 1U Storage
Spaces Direct RN*



Customers and typical use cases

Midrange and up

Public-sector
(tends to be Microsoft heavy)

Customers or managed
service providers invested in
Microsoft Hyper-V®

Typical Use Cases are customers who want to:

- Continue to use their known, industry-standard Microsoft Windows Server environments
- Upgrade to Windows Server 2016 and take advantage of its improvements
- Upgrade or host data-heavy applications, such as Microsoft SQL Server®, Microsoft SharePoint®, and Virtual Desktop Infrastructure (VDI)
- Deploy end-to-end, HCI client virtualization solutions using Microsoft RDS or Citrix XenDesktop/XenApp
- Improve storage capacity utilization and make storage management and operations more efficient
- Move forward in their virtualization strategies
- Remote Office / Branch Office (ROBO)
- Those with expiring PS/SC/VNX platforms (3/2/1 program)

Dell EMC makes implementation simple, flexible and worry free!



Installation and configuration



Single source support

Deployment

- Certified engineers ensure speed and accuracy
- Less risk and downtime
- Frees your IT staff to work on other priorities
- Flexible options to fit your needs and budget

Support

- One-stop cluster level support for hardware & software
- Covers OS, hypervisor and Storage Spaces Direct
- Comprehensive coverage whether license was purchased from Microsoft or Dell EMC
- Timely, reliable issue resolution

**39% faster deployments
than in-house resources**

**75% less
planning
time**



**Resolve server issues
up to 90% faster***

**#1 Microsoft
Partner 24 Gold
Competencies 30-
year relationship**

*Based on Sep 2015 Principled Technologies Test Report commissioned by Dell EMC. Actual results will vary. Full report: <http://facts.pt/1P56IW0>

[ProSupport for S2D Statement of Work](#)

DELLTechnologies

University of Pisa improves performance and utilization with S2D Ready Nodes



BUSINESS NEEDS

The University of Pisa needed to provide centralized infrastructure as a service (IaaS) for databases, web applications and more

BUSINESS RESULTS

25x faster

with NVME, Hybrid
configs for tiered
storage

**More
responsive**

web applications and
databases

Pre-configured

Tested and validated to
save time



“Our Dell EMC S2D Ready Nodes have significantly boosted our storage speeds and helped us provide our students and university staff consumer-like experience to their Hyper-V applications.”

Maurizio Davini
CTO University of Pisa in Italy

ProSupport for S2D Statement of Work

[link](#)

Commercial Service Contracts

Please choose your region and country below or consult the [FAQ section](#) for further information.

Americas Europe, Middle East & Africa Asia, Pacific & Japan



- How to locate
- If you purchased from Dell
- If you purchased from a Dell reseller
- For assistance

North America

- United States
- Anguilla (English)
- Anguilla (Spanish)
- Antigua & Barbuda (English)
- Antigua & Barbuda (Spanish)
- St. Lucia (English)
- St. Lucia (Spanish)
- Aruba (English)
- Aruba (Spanish)
- Bahamas (English)
- Bahamas (Spanish)
- Barbados (English)
- Barbados (Spanish)
- Bermuda (English)
- Bermuda (Spanish)
- British Virgin Islands (English)
- British Virgin Islands (Spanish)

Latin America

- Argentina (Spanish)
- Belize (English)
- Belize (Spanish)
- Bolivia (English)
- Bolivia (Spanish)
- Chile (Spanish)
- Colombia (Spanish)
- Costa Rica (English)
- Costa Rica (Spanish)
- Dominican Republic (English)
- Dominican Republic (Spanish)
- Ecuador (English)
- Ecuador (Spanish)
- El Salvador (English)
- El Salvador (Spanish)
- Guatemala (English)
- Guatemala (Spanish)
- Mexico (Spanish)

South America

- Brazil (Portuguese)
- Guyana (English)
- Guyana (Spanish)
- Suriname (Spanish)
- Suriname (English)

Service Description Supplement

Dell EMC ProSupport for Software for Storage Spaces Direct Ready Nodes Supplement

Introduction

Dell EMC¹ is pleased to provide Dell EMC ProSupport for Software for Dell EMC Storage Spaces Direct Ready Nodes Supplement together with corresponding ProSupport for Software service on Dell EMC Storage Spaces Direct Ready Nodes solution as set forth on the Order Form, the "Service". This document supplements the ProSupport for Software service description, (this document, together with your corresponding ProSupport for Software service description, are the "Service Description"), and amends, supplements, is incorporated by reference into, and shall be read together with your corresponding ProSupport for Software service description, and with your applicable master agreement, as described in the Dell Services Terms & Conditions section of the service description for your ProSupport for Enterprise Suite service. The terms of the ProSupport for Software and ProSupport Enterprise Suite service descriptions are available at www.dell.com/servicecontracts/global.

Dell EMC ProSupport for Software for Storage Spaces Direct Ready Nodes is offered only on Dell EMC Storage Spaces Direct Ready Nodes and is only available in conjunction with ProSupport, ProSupport Plus for Enterprise, ProSupport One, or ProSupport Flex for Data Center service (the "ProSupport Enterprise Suite") offers on the Ready Node.

For additional assistance, or to request a copy of your governing agreement applicable to the Services, contact your Dell EMC sales representative or reseller.

Scope of Service

- Call handling by the Dell EMC ProSupport team and Storage Spaces Direct solution specialists with knowledge of the Dell EMC hardware, software-defined storage, networking technologies, and MS Windows, and how these products and technologies interoperate to provide a hyper-converged storage solution.
- One-stop cluster level support for hardware and software which encompasses the entire solution rather than piece parts. Combined with the deployment guide and support matrix, it offers complete solution value.
- When required, we offer correct replacement disk parts that are validated for Dell EMC Storage Spaces Direct Ready Node, ensuring that there is little downtime of the environment.
- ProSupport for Software for Dell EMC Storage Spaces Direct Ready Nodes support includes cluster-level support for both OEM and Bring Your Own License (BYOL).
- Support is available only on Dell EMC Storage Spaces Direct Ready Node configuration.
- The following Dell EMC Storage Spaces Direct Ready Node features are covered: Hyper-V, Failover Clustering, Storage Spaces Direct, Storage Replica, native Windows Backup, and Windows Volume Snapshot Service (VSS).
- The following operating system features vis-à-vis MS Storage Spaces Direct are not covered: Windows Server Software Defined (WSSD) Premium, BitLocker, Shielded VM's and SDN.

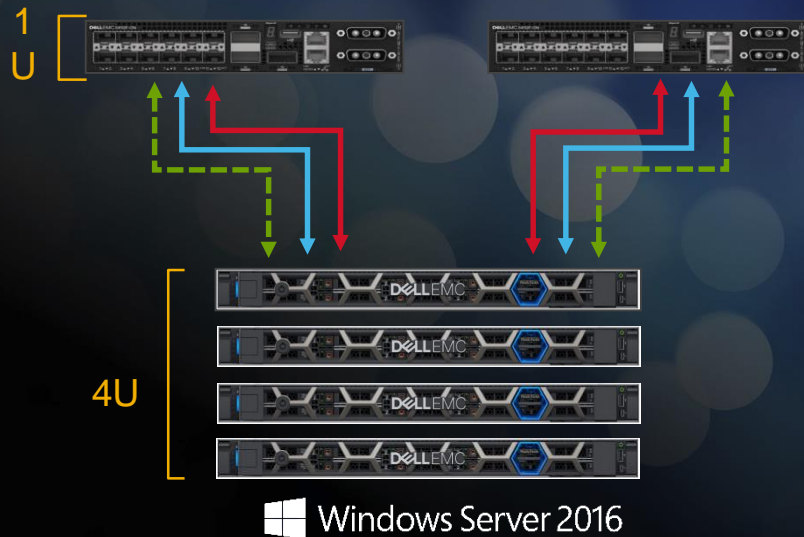
The Storage Spaces Direct solution specialists will provide remote support in the following areas:

- Advise on features, functionality, cluster configuration issues, firmware versions, interoperability, and other cluster concerns. This is done in alignment with the best practices set forth in the Dell

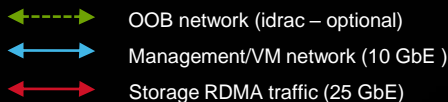
¹ "Dell EMC" as used in this document, means the applicable Dell sales entity ("Dell") specified on your Dell Order Form and the applicable EMC sales entity ("EMC") specified on your EMC Order Form. The use of "Dell EMC" in this document does not indicate a change to the legal name of the Dell or EMC entity with whom you have dealt.

Ready Solution for WSSD: QuickStart Config for SMB/ROBO/Edge environments

Highly available, end-to-end HCI solution : Simplify design, ordering, deployment and support



4x R640/R740xd S2D Ready Nodes



QuickStart 4x2 Configuration

- Improved Sales Velocity for direct and channel
- Simpler configuration and T-Shirt sizing
- Detailed deployment and operations guidance
- Solution Components:
 - 4 R640 / R740xd S2D Ready Nodes
 - 2 Fully redundant S4112-ON Switches
 - Windows Server 2016
 - ProSupport and ProDeploy Services
 - Racks and PDUs (DCI)

Ready Solution for Microsoft SQL Server Benefits

With all-flash Storage Spaces Direct Ready Nodes

**NEW modern
hyper-converged
solution**



Storage Spaces Direct
4 x PowerEdge R640

Savings vs
AWS & Legacy

29% less expensive than AWS *

Compared to dedicated M5 w/3 years upfront + monthly expenses

60% less expensive than legacy systems

11 PowerEdge R720 servers + power & cooling + VMware licensing

Consolidation
& Performance

Nearly 3 to 1 server consolidation

11 PowerEdge R720 servers replaced by 4 S2D Ready Nodes

Sub-millisecond latency + high IOPS

Peak and average storage latency times below 1 millisecond

Scalability &
Protection

Near linear scalability

Findings show all-flash design scales with database workloads

Backup in 3.8 min and restore in 9.25 min

Data Domain DD6300 backed up and restored 431 GB database

* Based on Dell EMC internal analysis, August 2018. Estimated costs with U.S. pricing calculated over 3 years, comparing the Ready Solution to an equivalent AWS cloud solution. Includes up-front costs, power and cooling costs, and administration and support costs. The AWS solution also includes 36 monthly of monthly expenses. Public online calculator used for AWS pricing estimates. Actual costs will vary.

Windows Server 2019 Datacenter edition

Key new WSSD Storage Spaces Direct features



Admin Center Integration

Storage Migration Service, Storage Replica and Azure



Deduplication with ReFS Volumes

Windows Server block based deduplication comes to ReFS volumes delivering significant storage and cost savings with the greater resiliency of ReFS.



Efficiency: Mirror Accelerated Parity

Achieve the best combination of storage efficiency and performance



Storage Class Memory Support

This new type of device brings flash closer to the processor to drastically reduce latency and increase performance.



Cluster Sets

Create massive scale out clusters with cluster sets.



Scale: Industry Leading Scale

Windows Server 2019 raises the scalability limits to new heights for Storage Spaces Direct.

Dell EMC Consulting Services for Microsoft

51 Microsoft Partner of the Year awards

28 Global Microsoft Competencies

16,000 Global certified Microsoft service professionals

Advise

Workshops, Assessments & Advisories

Plan

Design, Architecture & Blueprints

Execute

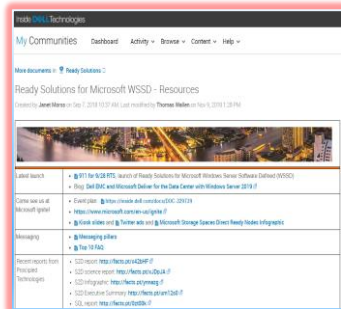
Implement & Integrate, Migrate & Replatform, Operate & Optimize

Azure | Active Directory | Dynamics 365 | Exchange | Power BI | Office 365 | SharePoint | SQL Server | System Center | Windows Server

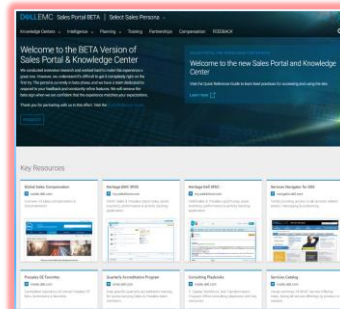
Resources



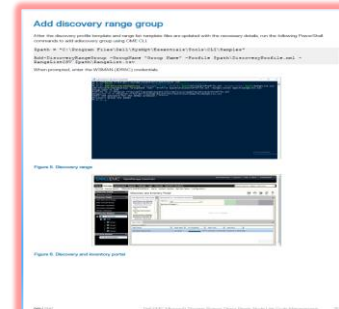
[Ready Solution for WSSD](#)



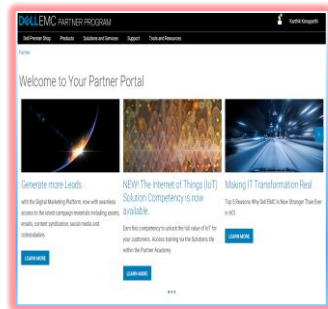
[Inside Dell](#)



[Sales Portal](#)



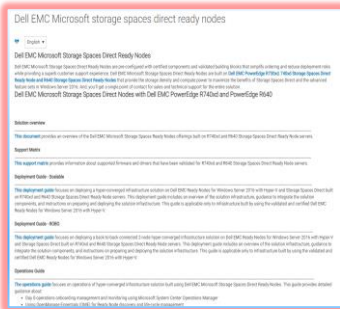
[Operations Guide](#)



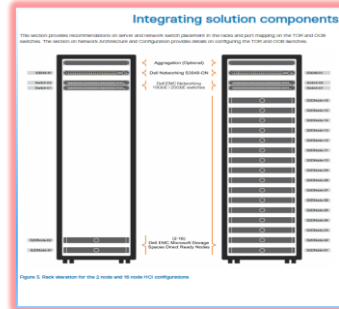
[Dell EMC Partner Portal](#)



[Solution Overview](#)



[Knowledge Base](#)



[Deployment Guide](#)

For any question or assistance needed regarding Microsoft Storage Spaces Direct of the Dell EMC S2D Ready Nodes, please reach out:

S2D_ReadyNode@Dell.com

Thank you!

DELLTechnologies

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