Hewlett Packard Enterprise

Modernize and accelerate your SQL Server infrastructure

Benefits to total cost of ownership (TCO)
Virtualize Microsoft Windows® database servers onto fewer physical servers, handle database sprawl, realize cost savings through greater efficiencies, and expand capacity quickly when needed.

Proven solution performance
Tested to handle more than 6.4 million Orders Per Minute (OPM) in an 8 node Microsoft Storage Spaces Direct cluster running SQL Server 2016.

Ready to address future needs
Flexible deployment options allow for scaling up or down in each server, along with the ability to scale out to 16 nodes, enabling configurations to support larger databases, more users, and ever diverse workloads.

Tested solution elements
- 8 x HPE ProLiant DL380 Gen9 Servers
- 4 x 800 GB HPE NVMe SSDs and 16 x 1.6 TB SATA SSDs from Intel in each server
- 2 x Intel Xeon E5-2695 v4 processors in each server
- Microsoft Storage Spaces Direct
- Microsoft SQL Server 2016
- Performance measured with DVD Store version 2.1

HPE-All Flash Storage Spaces Direct Solution for SQL Server
Realize better economies and improve performance in your data centers with a software-defined, NVMe-optimized platform powered by Intel®.

A modern database hosting platform
Database workloads are some of the most complex and resource-intensive workloads in a data center. They need solutions that deliver fast time-to-business value, provide a positive return on capital investment, reduce operating expenses, and provide high availability along with rapid deployments. The rise in usage of all-flash, solutions is enabling new deployment options to address the needs of database workloads.

Hewlett Packard Enterprise and Microsoft® are now offering a new approach for SQL Server database workloads—addressing the needs for performance, uptime and scalability in a cost-optimized manner.

Easy scalability and consistently low latency is key to Quality of Service (QoS) Hewlett Packard Enterprise and Microsoft have created a new All-Flash Storage Spaces Direct Solution for Microsoft SQL Server 2016. Bundling a hypervisor, compute, networking, storage and management into a single software-defined solution enables a new paradigm for database infrastructure.

Flash is a critical element in this solution as database workloads are notoriously dependent on low latency (fast transactions). The use of HPE NVMe SSDs in this solution as a caching tier enables SQL Server to take advantage of both the latency and throughput advantages inherent to PCIe-attached SSDs while the streamlined NVMe software stack offers an additional latency reduction to ensure CPUs can continuously be fed data.

The benefits of this solution are numerous:

- **Faster time to business decisions** driven by the highly performant all-flash architecture.
- **Achieve lower operating costs** through a simplified infrastructure and reduced data center footprint.
- **Minimize the complexity and overhead** of external storage and stores data on a virtualized pool of all the locally attached SSDs in aggregate.
- **Deliver better user experience** from faster application response times.
- **Pay as you grow**—size your cluster for initial needs and only pay for additional capacity/expansion when needed.

This tested and proven blueprint is built on HPE ProLiant DL380 Gen9 servers powered by Intel® Xeon® processors to support the most demanding of online transaction processing (OLTP) decision support system (DSS) workloads. With HPE and Microsoft, you receive a high-performing SQL Server engine in a full-featured system that leverages standards-based x86 technology to ensure the optimal total cost of ownership for your investment.

Testing results
- 6.4 million Orders Per Minute (OPM) cluster-wide
- 144 Virtual Machines, 18 per server, average of 44,550 OPM per Virtual Machine
- 204.8 TB of raw capacity cluster-wide, 25.6 TB raw capacity per server
- 68.3 TB usable capacity with 3-way mirroring cluster-wide
- Easily scalable by adding more SSDs and more servers (up to 16)
- Rapid deployments with lower software costs and less hardware complexity

Designed for scalability

This HPE Storage Spaces Direct Solution for SQL Server is comprised of eight ProLiant DL380 Gen9 Servers using Microsoft's built-in Cluster Shared ReFS Volumes with two tiers (caching and capacity) of storage. Intel-based 800 GB Write Intensive NVMe SSDs are used for caching, and Intel-based 1.6 TB Mixed Use SATA SSDs are used for capacity.

Clusters can start at just four nodes, and can grow to sixteen, while each node can also be scaled up with additional SSDs.

The right solution based on the right technology

HPE ProLiant DL380 Gen9 Servers

Get reliability, serviceability, and near continuous availability—all backed by a comprehensive warranty—from the data center standard for business-critical database applications. Designed to reduce costs and complexity, HPE ProLiant DL380 Gen9 Server leverages Intel Xeon E5-2600 v3 and v4 processors, along with the latest **HPE DDR4 SmartMemory** supporting capacity up to 3.0 TB. It also features support for 40GbE NIC with a broad range of graphics and workload accelerator options. HPE ProLiant DL380 Gen9 Server simplifies management for more cost savings, with powerful new capabilities for automating and simplifying system deployment, maintenance, and troubleshooting.

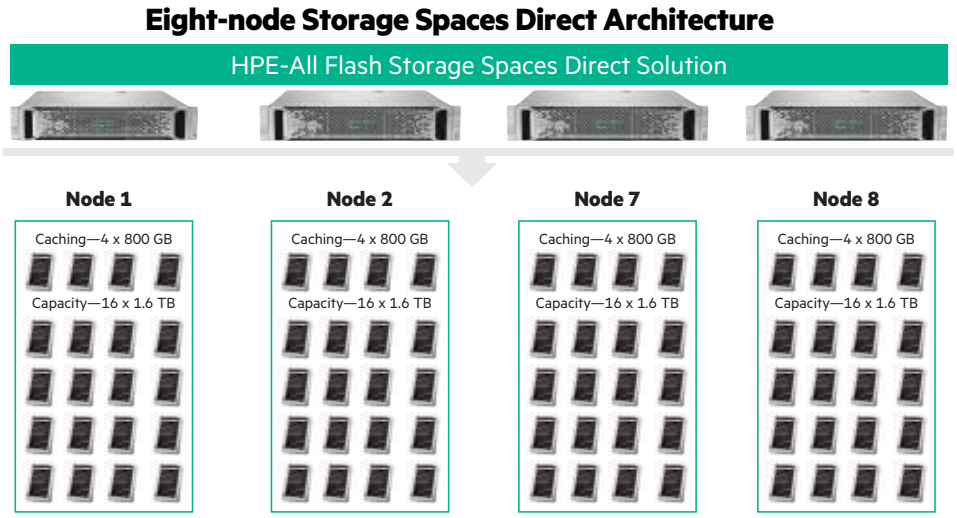

Figure 1. HPE All-Flash Storage Spaces Direct Solution

Partners you can rely on Microsoft Hyper-V and Storage Spaces Direct

Bolster IT efficiency and flexibility with faster virtualized application deployment and maintenance. Built on Hyper-V, included in Windows Server®, Microsoft virtualization solutions help reduce costs by consolidating more workloads on fewer servers. Increase IT agility and flexibility across on-premises and cloud resources with Microsoft virtualization. Storage Spaces Direct uses industry-standard servers with local-attached drives to create highly available, highly scalable software-defined storage at a fraction of the cost of traditional SAN or NAS arrays. Its converged or hyper-converged architecture radically simplifies procurement and deployment, while features like caching, storage tiers, and erasure coding, together with the latest hardware innovation like RDMA networking and NVMe drives, deliver unrivaled efficiency and performance.

Microsoft SQL Server 2016

SQL Server 2016 includes database innovations that deliver new levels of efficiency, performance, security, and availability.

NVMe storage from Intel

The Intel Solid State Drive (SSD) Data Center Family for PCIe brings extreme data throughput directly to Intel Xeon processors with up to six times faster data transfer speed than 6 Gbps SAS/SATA SSDs. The performance of a single drive from the Intel SSD Data Center Family for PCIe, specifically the Intel SSD DC P3700 Series (460K IOPS), can replace the performance of 7 SATA SSDs aggregated through an HBA (~500K IOPS). The P3700 Series is a PCIe Gen3 SSD architected with the new high performance controller interface—NVMe (Non-Volatile Memory Express) delivering leading performance, low latency and Quality of Service.

Let's make it happen together

Microsoft SQL Server 2016 with Microsoft virtualization technology running on Intel NVMe-enabled HPE ProLiant DL380 platform can transform the user experience and your business. Contact your HPE representative today.

Learn more at

ssd.hpe.com/recommendations

Our solution partners

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