

Scale Microsoft SQL Server Using Dell EMC Ready Solution

Achieve exceptional and consistent performance while scaling in a mixed workload environment

Rapid SQL Server growth challenges IT organizations

In a [2018 survey of professional software developers](#), Stack Overflow found that SQL Server was the second most popular database platform among professional developers and only six percentage points behind the leader MySQL. The popularity of SQL Server creates pressure on administration teams to create a database ecosystem that can keep up with both rapid growth and faster response goals. The primary challenge today is to identify solutions that can meet these growth and performance challenges, without ballooning costs, through better automation and standardization.

Accelerate SQL Server by consolidation on a proven platform

In the cloud era, IT organizations need to accelerate, automate, and consolidate databases on a proven solution that scales. The benefits of consolidating the database ecosystem to a highly scalable solution include simplification of management, accelerated provisioning, and greater agility.

Highly scalable database solutions enable the IT organization to grow the number of SQL Server databases while maintaining the performance levels expected by application developers and users. The ability to achieve greater levels of consolidation while maintaining performance results in a better return on investment to the business.

Consolidation platforms simplify management and provisioning because all the databases share a common infrastructure. Operations such as cloning, replicating, and provisioning new databases are consistent across business application designs, thus, accelerating time-to-delivery. This greater agility enables the IT organization to move toward a cloud services model in which database requests can be fulfilled quickly and consistently.

Dell EMC Ready Solution for Microsoft SQL: Dell EMC Unity 650F All Flash Storage

Dell EMC Ready Solutions for Microsoft SQL are designed for superior performance, better return on investment, and future-ready scalability. This new Ready Solution for Microsoft SQL combines award-winning Dell EMC PowerEdge server R740¹ servers with the all-flash capabilities of the Unity 650F storage array for a high-performance scalable infrastructure.

¹ <https://www.dell.com/en-us/work/shop/povw/poweredge-r740>

Contents

- ❖ Rapid SQL Server growth challenges IT organizations
- ❖ Accelerate SQL Server by consolidation on a proven platform
- ❖ Dell EMC Ready Solution for Microsoft SQL: Dell EMC Unity 650F All Flash Storage
- ❖ Online transaction processing workload testing
- ❖ Decision-support workload testing
- ❖ Dell EMC Live Optics: Monitoring and analysis at no cost
- ❖ Scale and consolidate Microsoft SQL Server with Dell EMC
- ❖ Dell EMC Services for Microsoft SQL Server
- ❖ Additional resources

Essentials

This Dell EMC Ready Solution for Microsoft SQL addresses current and future business challenges by providing a consolidation platform that scales to meet growing needs. Based on Dell EMC PowerEdge R740 servers and Dell EMC Unity 650 All Flash storage, the solution provides near-linear scalability, sub-millisecond storage performance, and support for multiple workloads.

PowerEdge rack servers combine a highly scalable architecture and optimum balance of compute and memory to maximize performance across the widest range of applications. The PowerEdge R740 server is a two-socket server that uses Intel Xeon processors with up to 28 cores per processor. This server can have up to 3 TB of DDR4 memory, enabling high SQL Server cache hit ratios even in scenarios with greater database consolidation.

The Unity 650F array is ideal for latency-sensitive applications like high-throughput transactional databases. This platform also offers administrative flexibility with these key features:

- Unification of block, file, and VMware VVols support
- Snapshots and replication: synchronous and asynchronous
- A maximum of 16 PB of raw storage
- Enhanced virtualization and deduplication
- The capability to maximize all-flash storage with new inline data reduction

This Ready Solution for Microsoft SQL is an integrated solution that offers customer design flexibility. Customers can easily size the Ready Solution to match their specific database requirements. It's easy to expand with additional storage and PowerEdge servers while retaining the value of a single pretested and validated solution design.

Online transaction processing workload testing

This Ready Solution has been validated in our Dell EMC labs using Quest Benchmark Factory² to simulate real-world online transaction processing (OLTP) application workloads. We gradually increased the number of virtual machines hosting SQL Server databases to show how the Ready Solution scales in growing environments. A key requirement for testing the solution was to capture performance statistics to demonstrate that this system offers the scalability needed to reliably consolidate SQL Server databases on a shared infrastructure environment.

Transactions per second (TPS) is an indicator that database performance professionals use to measure database activity during testing and operations for platforms such as Microsoft SQL Server. Our tests show that the Ready Solution for SQL Server with Unity storage scales well under increasing workloads. The solution demonstrated strong near-linear TPS scalability, as shown in Figure 1, as more SQL Server instances were added to the environment. With the ability to deliver consistent performance under increased incremental workload, this solution can be used as a consolidation platform for your new or existing SQL Server ecosystem.

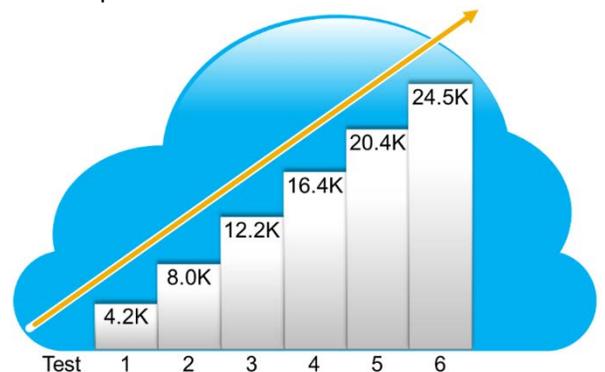
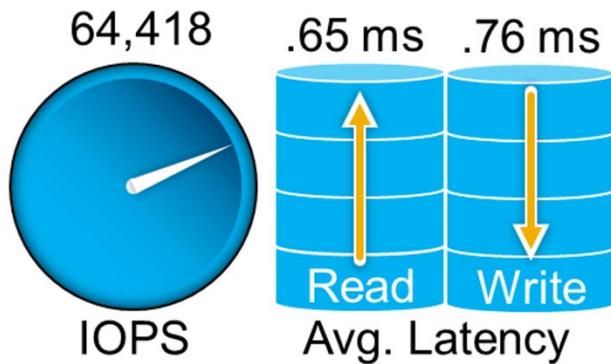


Figure 1. Solution scaling under increasing workloads

Input/output operations per second (IOPS), another metric used by computer performance professionals, indicates the application-generated demand on a storage system. Our incremental workload tests conducted for this paper were not designed to demonstrate maximum load (TPS) or drive the highest IOPS values possible; instead, they were designed to show that IOPS increase predictably as database loads increase. Test findings show that with each increase in workload the Unity 650F storage array consistently delivered 10,317 IOPS for each simulated database application.

² <https://www.quest.com/products/benchmark-factory/>



When the six database applications were all running on separate virtual machines, the Unity array achieved a total of 64,418 IOPS, as shown in Figure 2.

A high proportion of the IOPS from OLTP workloads are small block size reads and writes. An important indicator of the storage system contribution to overall OLTP workload performance is the measure of physical read and write latencies in seconds per operation.

Figure 2. OLTP performance

The lower the latency the less time the database waits for reads and writes from storage. The gold standard for all-flash storage arrays is an average latency of 1 millisecond (ms) or less for all physical database operations. Dell EMC lab findings show that read latency remained consistently under the 1 ms gold standard as shown in Figure 2.

Write latency is critically important because it supports the durability aspect of atomicity, consistency, isolation, and durability (ACID)-compliant databases. In our tests, write latency, while remaining slightly higher than read latency, was measurably below the 1 ms gold standard target.

Looking at TPS, IOPS, and latencies provides a comprehensive picture of how this Ready Solution performs and scales under increasing workloads. Test findings show that application workloads can achieve near-linear scalability on this solution for Microsoft SQL Server OLTP applications. As more databases were added to the environment, IOPS increased and average read and write latencies remained consistently low. This enables the IT organization to quickly deliver databases at performance levels that application users expect.

Decision-support workload testing

In addition to running OLTP workloads, we ran an online analytic processing (OLAP) workload typical in decision-support environments by using the HammerDB TPC-H testing tool. Our focus in running the decision-support workload was to report on the throughput test results. Throughput tests measure the ability of the solution to process a set number of large complex queries in as little time as possible.

Figure 3 shows the Throughput @ Size totals for each incremental test. The Throughput @ Size indicates the number of queries per hour multiplied by the scale factor.

We used a scale factor of 1,000, generating a 1 TB SQL Server test database for workload simulation. The Throughput @ 1000 value indicates the capability of the system to support more decision-support queries; thus, the higher the value the better. Because this test is a noncertified TPC-H test, we make no comparisons to other systems; instead, we analyze the findings to determine if the solution scales well with increasing decision-support workloads.

The test findings for this solution show that the system delivered near-linear scalability across the three incremental workload tests. Customers with decision-support workloads can expect reduced response times for large, complex queries even when driving more throughput, thus achieving faster time-to-insight with the new Ready Solution for SQL Server.

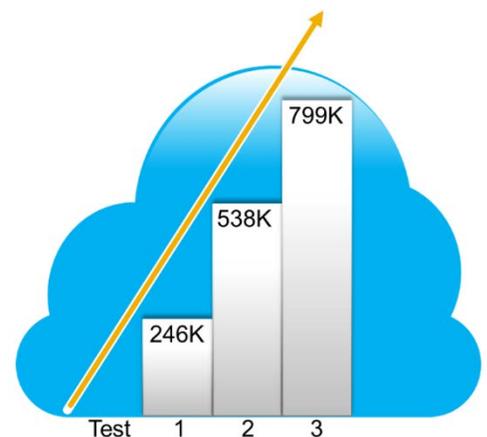


Figure 3. Throughput @ Size

Dell EMC Live Optics: Monitoring and analysis at no cost

One of the primary tools that Dell EMC uses for data collection during validation and use case testing is Dell EMC Live Optics—free, agentless software for collecting data from PowerEdge servers. In just minutes, a team can set up Live Optics to collect a wealth of configuration and resource utilization information for analysis. The intuitive Live Optics dashboard enables DBAs to monitor and collect data from both servers and the VMware virtualization layers in a single tool.

Figure 4 shows an example of a Live Optics dashboard. The left side shows performance at the project, hypervisor, virtual server, and shared disk levels. The right side shows the collected data and graphs that can assist with quick visual analysis.

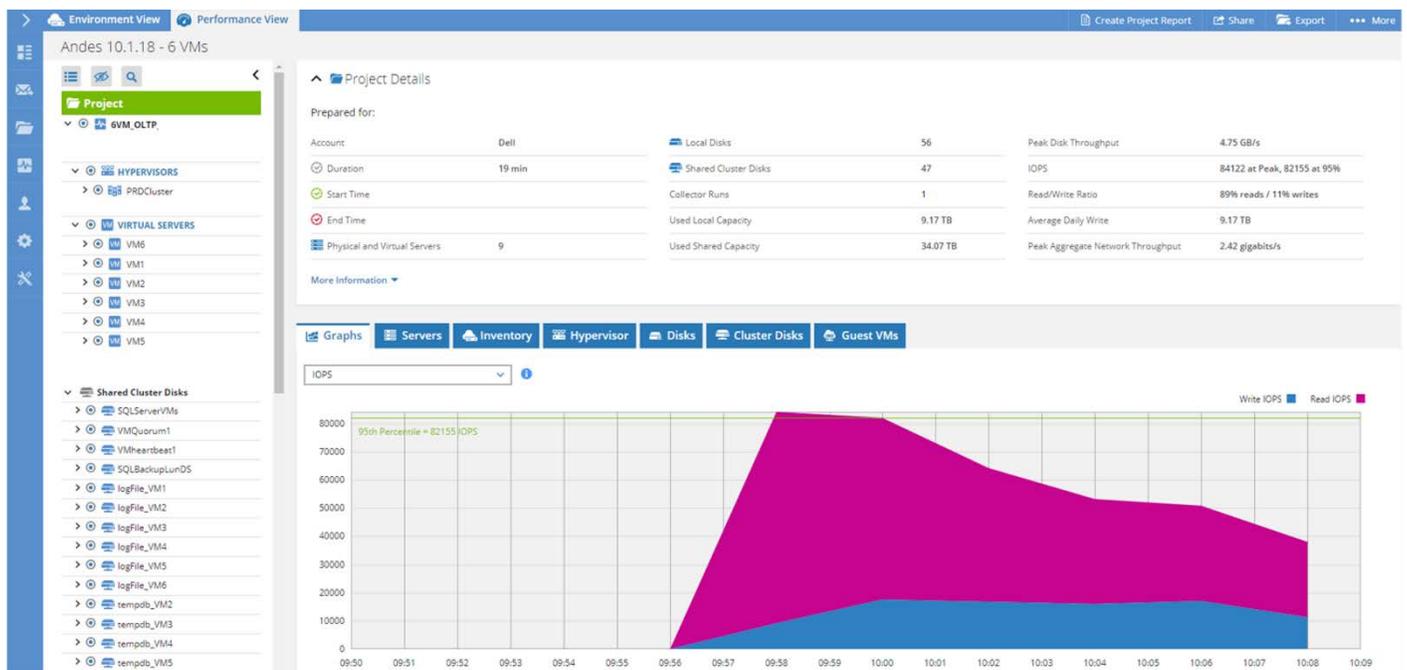


Figure 4. Live Optics dashboard

Most of our test analysis used Live Optics to develop performance findings and reporting graphics. Dell EMC Engineering and many of our customers use Live Optics to collect an abundance of information, with very low load impact on their servers. Learn more about Dell EMC Live Optics here: [Dell EMC Live Optics](#).

Scale and consolidate Microsoft SQL Server with Dell EMC

Businesses today want to achieve performance improvements without increasing complexity while responding to the rapid growth in data management and demands for new application development. IT organizations are pressured to do more and support more with flat or declining investments. New solutions that can accelerate a wide range of applications and workloads are the key to meeting those demands. You can deploy Dell EMC Ready Solutions for Microsoft SQL with confidence, knowing they have been tested and validated to help take the guesswork—and risk—out of deploying a SQL Server infrastructure.

This Ready Solution for Microsoft SQL delivers the capabilities needed to address both today's and tomorrow's business challenges by enabling IT organizations to rapidly grow their database ecosystem.

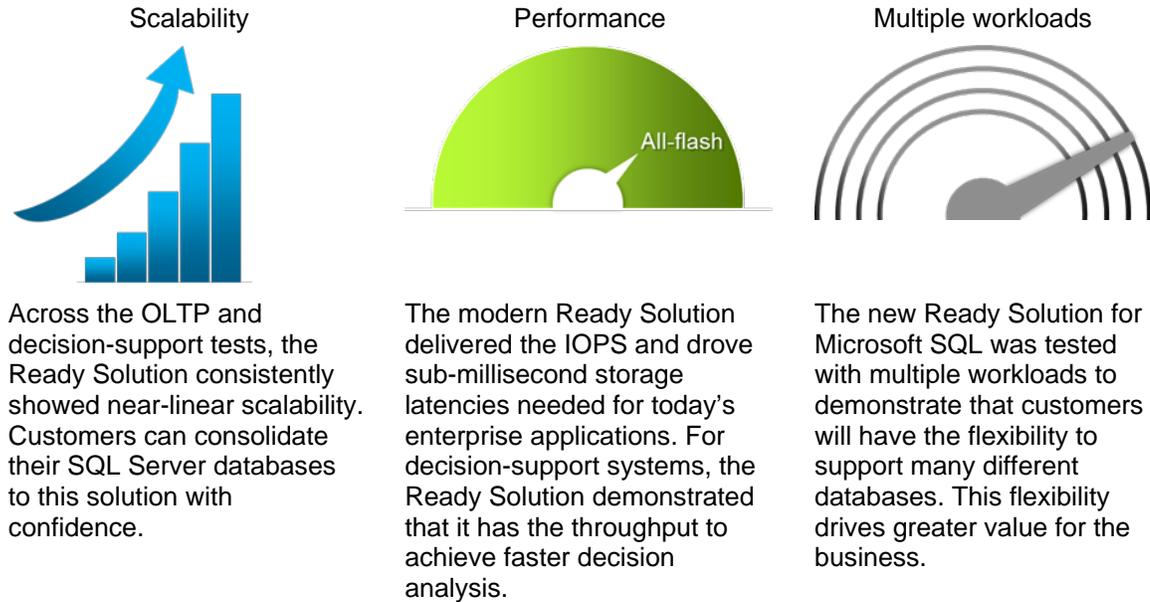


Figure 5. Solution benefits

Dell EMC Services for Microsoft SQL Server

Dell EMC is a Microsoft Gold certified business intelligence and analytics partner. Rely on our expertise across your full spectrum of Microsoft SQL Server, business intelligence, and Big Data needs. Dell EMC can help you:

- Improve data quality with a modernized data landscape
- Deploy, migrate, and modernize services in the cloud or on-premises
- Reduce costs for platform licensing
- Improve protection, performance, and recoverability of cloud-based and on-premises Microsoft SQL Server environments

Realize benefits that many other enterprises around the globe have experienced in working with Dell EMC—a certified, award-winning Microsoft partner. Our holistic approach to providing services for your Microsoft environment can help you minimize risk and business disruption—making us the partner of choice for your Microsoft SQL Server endeavors.

Additional resources

Ready Solutions come with detailed guides that enable customers to understand how to deploy the solution and the best practices that Dell EMC used to optimize performance:

- [Dell EMC Ready Solutions for Microsoft SQL: Dell Unity 650F All Flash Storage Design Guide](#)—This design guide describes the architecture, design, configuration best practices, and sizing guidelines for a SQL Server 2017 solution with Windows Server 2016, VMware vSphere 6.7 on PowerEdge R740 servers, and Unity 650F All Flash storage.

- [Dell EMC Ready Solutions for Microsoft SQL: Dell Unity 650F All Flash Storage Deployment Guide](#)—This deployment guide details how to deploy a virtualized Microsoft SQL Server 2017 solution using VMware virtualization on Dell EMC PowerEdge R740 servers and Dell EMC Unity 650F All Flash storage.
- [Dell EMC Services for Microsoft SQL Server: Service Overview](#)—This document describes how our services can accelerate your migration to the new Ready Solution for Microsoft SQL.

You can find a comprehensive list of documentation for Dell EMC Ready Solutions for Microsoft SQL at the [Microsoft SQL Info Hub for Ready Solutions](#) on the Dell EMC Community Network.

Dell EMC welcomes your feedback on the solution and the solution documentation. Contact the Dell EMC Solutions team by [email](#) or provide your comments by completing our [documentation survey](#).

Contact us

To learn more, contact your local representative or authorized reseller.



The information in this publication is provided as is. Dell Inc. makes no representations or warranties of any kind with respect to the information in this publication, and specifically disclaims implied warranties of merchantability or fitness for a particular purpose. Use, copying, and distribution of any software described in this publication requires an applicable software license.

Copyright © 2019 Dell Inc. or its subsidiaries. All Rights Reserved. Dell Technologies, Dell, EMC, Dell EMC and other trademarks are trademarks of Dell Inc. or its subsidiaries. Intel, the Intel logo, the Intel Inside logo and Xeon are trademarks of Intel Corporation in the U.S. and/or other countries. Other trademarks may be trademarks of their respective owners. Published in the USA January 2019 Solution Brief H17582.

Dell Inc. believes the information in this document is accurate as of its publication date. The information is subject to change without notice.

Author: Sam Lucido