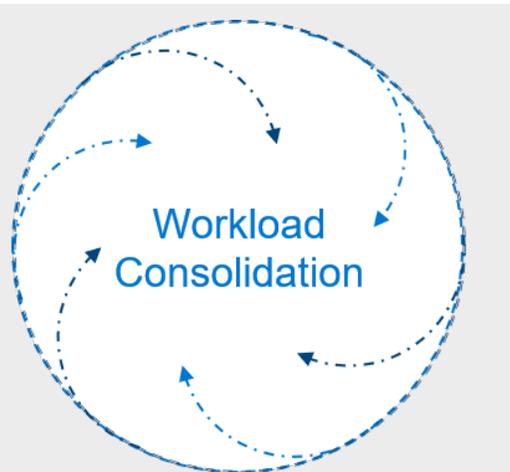


Consolidate and Simplify Mixed Database Workloads with Dell Technologies

Consolidate onto fewer servers and less storage for cost savings and higher return on infrastructure investments.



Essentials

- Run mixed databases and workloads on same IT platform
- Improve total cost of ownership (TCO) and return on investment (ROI)
- Process data at a higher rate
- Maximize valuable datacenter floor space
- Deploy fewer instances of the database software to help lower licensing costs
- Deliver predictable performance across workloads at scale

Data growth and proliferation challenges

A typical business runs hundreds of applications, with the average enterprise having as much as 464 custom applications.¹ It would be great if all your applications used the same type of workload – such as online analytics processing (OLAP) and online transaction processing (OLTP) – or at least the same vendor, but this is simply not the reality. While most organizations will say primarily run SQL Server, Oracle or SAP, there is always at least one other database supporting at least one application. Supporting multiple databases and workloads traditionally requires more infrastructure, leading to additional costs and less space in the data center.

This problem is only compounded by data growth. Data-intensive workloads — such as Internet of Things (IoT), big data analytics, artificial intelligence (AI) and machine learning (ML) — require more and more resources. Database growth, both in number and size, leads to:

- Increase in database and server sprawl
- Larger workload footprints
- Greater cost and complexity running workloads on siloed IT
- Longer maintenance and upgrade cycles
- Inefficient copy data management

How can you address the challenges brought on by multiple workloads, databases and rapid data growth?

Consolidation

Data center consolidation has long been seen the answer to many challenges when it comes to dealing with application and storage silos. However, organizations often stop short of consolidating mixed workloads or even databases for fear of impacting performance, throughput and protection. For many organizations, the perceived risks and complexities in consolidating databases overshadows the expected benefits.

It is for this very reason consolidation strategies must take into consideration ensuring the availability and performance of business-critical applications while maintaining low latency with fewer resources. The introduction of faster more powerful CPUs and new storage technology has made it possible for businesses to consolidate databases without the traditional associated risks.

Consolidation and IT modernization

Consolidation has many benefits the greatest of which is the ability of the business to increase infrastructure utilization without sacrificing performance while having the elasticity and agility to respond to new requests. Perhaps the greatest challenge to designing and delivering a consolidation solution is the uncertainty of how all the components will integrate and deliver on the investment.

Reference architecture approach

A reference architecture which has been designed, integrated and tested to run mixed workloads and databases on the same validated infrastructure must ensure the underlying infrastructure components meet the unique demands of each workload and database.

Modular server architectures

When it comes to consolidation, modular server infrastructures enable IT organizations to quickly add more storage, compute, or networking — depending on workloads and business needs. Designed to flexibly support both traditional and emerging workloads, such as IoT, artificial intelligence and machine learning, while simplifying and consolidating IT management, users can easily grow their workloads as needed.

This becomes especially important when consolidating multiple databases and workloads onto a single infrastructure. Modular servers enable you to dedicate servers to each database, separating the workloads from a compute perspective, which in turn optimizes licensing, lowers costs, simplifies management and enhances scalability and efficiency.

Storage designed for performance and parallelism

Mixed database workloads like Online Transaction Processing (OLTP) and Decision Support Systems (DSS) / Online Analytic Processing (OLAP) have traditionally been difficult to manage on the same infrastructure. Each of these workloads place different demands on the storage system. The storage system cannot be tuned for one workload but must support all loads with performance that meet Service Level Agreements (SLAs).

For example, when consolidating a smaller environment running a database on OLTP, while you may be looking to scale and grow, you may also require a smaller memory cache. If you are looking to consolidate 1 database on OLTP and OLAP with test/development, you may require larger memory cache while balancing IOPS and throughput; the infrastructure should also enable administrators to easily deploy test/development alongside production with minimum effort and resources. Finally, when considering hyper-consolidation of multiple databases and workloads — including analytics — on a single infrastructure platform means that performance and response times will have even greater impact on the business.

New storage technologies, like non-volatile memory express (NVMe) deliver new levels of performance and parallelism, paving the way for mixed database workloads. NVMe drives were designed to overcome the bottlenecking that occurs when fast flash-based storage collides with legacy data transport technologies. NVMe maximizes the power of flash drives and opens the door to the next media disruption with storage class memory (SCM).

Converged infrastructures strategy

Converged infrastructures (CI) provide the ideal platform for consolidation efforts—for both your data center footprint and your data-centric workloads. CI's bring together servers, storage, data protection and networking into a single turnkey engineered system. They centralize the management of these resources, to deliver significantly better business outcomes, including:

- more efficient IT operations.

Multiple workloads and databases Multiple databases on OLTP and OLAP with test/dev <ul style="list-style-type: none">• Largest memory/cache options• NVMe with flash technologies• Performance at scale• Mixed apps and workloads• Analytics
Multiple workloads One database on OLTP with OLAP and test/dev <ul style="list-style-type: none">• Large memory/cache• Improved IOPS vs. throughput• Structured/unstructured data• All flash bases arrays
Single application One database on OLTP multiple databases on OLTP <ul style="list-style-type: none">• Smaller memory/cache capability• Trade-off IOPS vs. throughput• Price/performance• Scale/growth

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- dramatically less unplanned downtime.
- much faster upgrades and patches than with a DIY approach.

CI's are optimal for workload consolidation strategies as they provide a rich set of data services to ensure high availability and data efficiency while also improving application performance and reducing downtime through flexible resource pools.

Consolidate mixed databases and workloads on the same Dell Technologies infrastructure

Dell EMC solutions are designed to assure performance, reliability, flexibility and manageability for high value workload environments and machine learning services. They are built using a scalable and resilient IT foundation that leverages the dynamic capabilities of today's database management systems and beyond.

To answer the challenge of running mixed databases and workloads on the same platform, the Dell EMC Ready Solutions teams for Oracle and Microsoft SQL Server have designed and tested an integrated reference architecture, using Dell EMC PowerMax and PowerEdge MX servers, and a CI using a VxBlock 1000 System. Both tests included Microsoft SQL Server and Oracle databases installed on the same platform running OLTP and OLAP workloads.

Testing of the reference architecture involved pushing the system to realistic service level limits and generating the maximum amount of load without most of the reads and writes exceeding one millisecond in latency. The validation testing exceeded expectations, demonstrating performance at scale.

The CI testing took this one step further, looking at how an integrated turnkey system can simplify consolidation efforts in the data center by eliminating hardware incompatibility, unifying management, and reducing operational and infrastructure costs.

The result is a Dell EMC reference architecture designed, integrated and validated to run mixed databases and workloads on the same infrastructure. For more details, refer to the published Reference Architecture Guide.

Component	Key Capabilities
<p data-bbox="159 1129 449 1161">Server and Networking</p>  <p data-bbox="191 1346 417 1402">PowerEdge MX700 Modular Chassis</p>	<p data-bbox="488 1003 1510 1087">Designed to flexibly support both traditional and emerging workloads, such as IoT, artificial intelligence and machine learning, the Dell EMC PowerEdge MX7000 modular chassis are ideal for consolidating workloads and databases.</p> <p data-bbox="488 1108 1498 1199">Its unique kinetic infrastructure, enables customers can break free from the bounds of technology silos and time-consuming, routine operational management while also dynamically assigning IT to optimally match different applications and needs.</p> <p data-bbox="488 1220 1463 1310">The low latency, high-bandwidth switching modules for multi-chassis environments include automated processes for topology compliance, quality of service and autonomous healing for peak network performance.</p> <p data-bbox="488 1331 1513 1535">Integrated Dell Remote Access Controller (iDRAC) is embedded within every Dell EMC PowerEdge server. It provides functionality that helps IT administrators deploy, update, monitor, and maintain servers with no need for any additional software to be installed. iDRAC functions regardless of operating system or hypervisor presence because from a pre-OS or bare-metal state because it is embedded within each server from the factory. iDRAC alerts administrators to server issues, helps them perform remote server management, and reduces the need for physical access to the server.</p>
<p data-bbox="215 1570 393 1602">Storage Array</p>  <p data-bbox="240 1749 368 1780">PowerMax</p>	<p data-bbox="488 1577 1422 1667">Consolidation with Dell EMC PowerMax lowers the overall cost of ownership by reducing the physical footprint, power and cooling requirements, and operating expenses.</p> <p data-bbox="488 1688 1487 1778">As the world's fastest storage array² it can deliver up to 10 million IOPS³ and 150 GB per second⁴ with 290 microsecond response times for demanding OLTP, decision support, real-time analytics and virtualized applications.</p>

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Component	Key Capabilities
<p data-bbox="212 216 394 247">Storage Array</p>  <p data-bbox="240 394 367 426">PowerMax</p>	<p data-bbox="488 222 1507 310">PowerMax arrays can support up to 64,000 devices/LUNs providing database administrator and test/development teams with plenty of space for replicas, snapshots, and unexpected bursts in storage growth.</p> <p data-bbox="488 327 1507 415">The NVMe drives introduce new levels of performance and parallelism that is the ideal match for mixed database workloads -- offer greater speeds combined with the ability to service more requests in parallel.</p>
<p data-bbox="175 501 431 562">Data Protection and Backup</p>  <p data-bbox="175 747 431 842">Data Protection Suite and PowerProtect DD Series Appliances</p>	<p data-bbox="488 459 1471 548">Dell EMC Data Protection solutions make it easy for Microsoft SQL professionals to protect data and manage backup requirements on their own terms—while using the most trusted backup storage on the market today.</p> <p data-bbox="488 564 1471 716">Dell EMC Data Protection Suite provides application consistent protection for SQL databases empowering data owners to perform backup and recovery operations directly from their native interfaces. Automated discovery of databases, VMs and storage allows IT Admins to take advantage of oversight and governance to ensure compliance.</p> <p data-bbox="488 732 1500 884">Dell EMC PowerProtect DD delivers up to 38% faster backups and up to 45% faster restores at higher compression levels.⁵ This improved level of compression efficiency increases the logical capacity by up to 30% per TB.⁶ It protects data and applications residing in on-premises traditional infrastructures to virtualized environments including public and hybrid clouds.</p>
<p data-bbox="215 1056 391 1117">Converged Infrastructure</p>  <p data-bbox="220 1367 386 1455">PowerOne and VxBlock 1000</p>	<p data-bbox="488 919 1495 1041">Dell EMC PowerOne transforms IT operations and helps accelerate your organization's journey to modernization in the cloud era. It is an all-in-one system that harnesses the power of Dell Technologies, bringing together PowerEdge MX servers, PowerMax storage, PowerOne Networking Fabric and the PowerOne Controller.</p> <p data-bbox="488 1058 1463 1146">The PowerOne Controller is powered by Kubernetes, Ansible, and a microservices architecture, automating thousands of tasks⁷ and enabling the deployment of work load-ready clusters with just a few clicks.⁸</p> <p data-bbox="488 1163 1474 1346">The Dell EMC VxBlock 1000 combines industry-leading technologies – including powerful Dell EMC storage and data protection options, Cisco UCS blade and rack servers, Cisco LAN and SAN networking, and VMware virtualization and cloud management – into one fully integrated system. It leverages its deep VMware integration to simplify automation of everything from daily infrastructure provisioning tasks to delivery of IaaS and SaaS.</p> <p data-bbox="488 1362 1500 1484">VxBlock Central software provides a single, unified interface. VxBlock Central is a feature-rich, next generation, CI management solution providing comprehensive Awareness, Analytics and Automation capabilities and strong integration with VMware vRealize.</p> <p data-bbox="488 1501 1507 1589">These converged infrastructure solutions not only support data center and data-centric workload consolidation strategies but can also help accelerate an organization's shift from traditional operations to modern cloud outcomes.</p>

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Benefits of Consolidation with Dell Technologies

Consolidating your mixed workloads and databases onto a single platform with Dell EMC architecture can help you collapse multiple storage silos, drive efficiencies and achieve greater visibility into the performance, availability and health of your infrastructure.

Maximize ROI

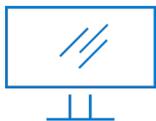
- Save energy as fewer servers require less heating and cooling
- Conserve valuable data center space
- Lower licensing costs because fewer instances of the database software are required
- Improve CAPEX and OPEX at scale with great performance

Simplify management

- Improve backup and disaster recovery through centralization
- Deliver predictable performance at scale for mixed workloads
- Ensure application-driven data protection and long-term reliable backup retention
- Provision copies at the speed of the business through greater agility

Future-proof

- Enable cloud operating model efficiency and savings
- Strive for Always On in the digital era



Learn More about
Dell EMC [Ready Solutions for
Microsoft SQL](#)
and
[Ready Solutions for Oracle](#)



[Contact](#) a Dell Technologies Expert

¹. Cloud Security Alliance and Skyhigh Networks, "Custom Applications and IaaS Trends 2017"

². Based on Dell EMC internal analysis of published bandwidth for PowerMax 8000 versus competitive mainstream arrays, March 2018.

³. Based on Dell EMC internal analysis of max IO/s per second (within a single array) for the PowerMax 8000, March 2018.

⁴. Based on Dell EMC internal analysis of GBs per second (within a single array) for PowerMax 8000, March 2018.

⁵. Based on Dell EMC internal testing with DD Boost protocol on DD9900 with DDOS 7.2 vs. DD9800 with DDOS 7.2, April 2020. Actual results may vary.

⁶. Based on Dell EMC internal testing with DDOS 7.0, Aug 2019. Actual results may vary.

⁷. Based on internal Dell EMC testing, Sept 2019. Analysis of manual steps replaced by PowerOne automation on a 16 node 4 chassis system over 5 years. Actual results will vary. G19000374

⁸. Based on internal Dell EMC testing, Sept 2019. Analysis of manual steps replaced by PowerOne when automating VMware cluster creation on a 16 node 4 chassis system. Actual results will vary. G19000375