Validated System for Virtualization with Oracle

Contents

Essentials

Reduced complexity and TCO

A Dell EMC Validated System eliminates database silos, simplifies management, and reduces costs.

Streamlined, customizable design

Customers work with their Dell EMC representative and the System Builder collaboration tool to define infrastructure requirements.

Maximum flexibility

DBAs can tailor the system to their meet specific workload and Oracle licensing requirements.

Standards compliance

All components of the converged infrastructure meet certification, interoperability, capability, and supportability standards, including interoperability with VMware vSphere.

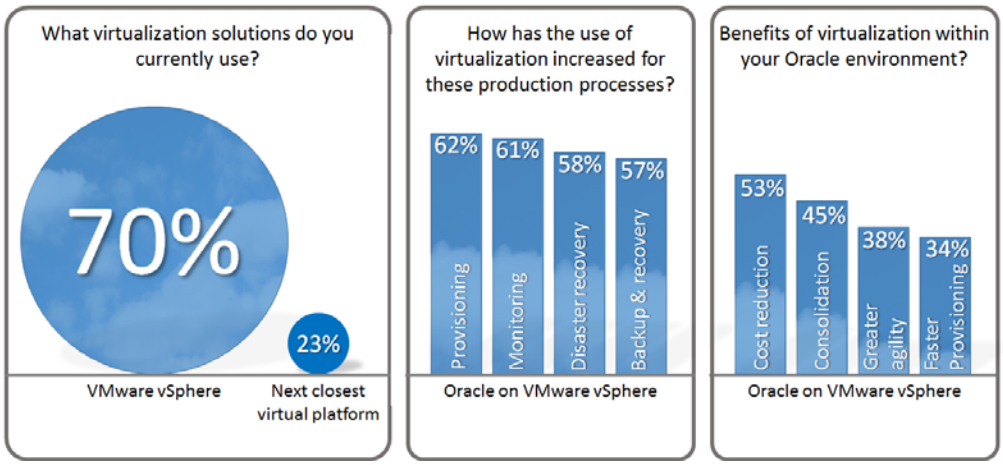
Automated lifecycle management

Active System Manager automates and streamlines key operational functions and provides a unified dashboard with a view of the entire infrastructure.

Business case

Managing the isolated islands of resources commonly found in most database infrastructures has been an ongoing challenge for IT organizations. From equipment procurement to installation and configuration, interdependent tasks increase organizational and technical complexity. Customers frequently report that maintenance and management of database silos require significant training and support that drive up the total cost of ownership (TCO). These challenges are quickly becoming more of a concern as structured and unstructured data management requirements grow.

VMware vSphere is the most widely adopted virtualization platform in the industry. More than 70 percent of database administrators (DBAs) surveyed for The Empowered Database: 2016 Enterprise Platform Decisions Survey use VMware for Oracle database deployments. With virtualization, DBAs have seen substantial process improvement when performing production database operations such as provisioning, monitoring, disaster recovery, and backup and restore. For example, vSphere integration with Dell EMC storage simplifies creating copies of databases and enterprise applications. Overall, DBAs report that cost reduction and simplified consolidation are among the top benefits of virtualizing their Oracle environments.



VMware virtualization acceptance and benefits

Although moving databases to a virtualized platform produces demonstrable benefits for many organizations, DBAs must always weigh the risk of any potential disruption to critical applications that would have significant negative impact on the business. New or updated database environments must use a pretested and validated infrastructure to ensure that they have a trusted platform for business applications with tight hardware-to-virtualization integration. All components of the compute, network, and storage stack that power a Validated System from Dell EMC are thoroughly tested to certify interoperability with vSphere. Database teams using a Dell EMC Validated System can eliminate the certification and configuration complexities that are associated with the do-it-yourself (DIY) silo approach. Deploying a Validated System

enables database teams to accelerate database migrations to a new standardized infrastructure and realize the benefits of virtualization more quickly.

Validated solutions for Oracle virtualization

In an effort to control costs and increase staff efficiency, many IT organizations want to standardize their infrastructure and transition away from heterogeneous silos for database environments. DBAs understand the importance of modernizing the data center instead of continuing to promote "legacy IT" database silos. As discussed in a *Database Trends and Applications* report, in a 2016 survey of Independent Oracle Users Group members, DBAs agreed that business-as-usual maintenance of databases and data centers is preventing organizations from investing in forward-looking initiatives.

The traditional IT method of data center upgrading is a complex, multiple-phase process of development and then ensuring compliance with standards for certifications, interoperability, capability, and supportability. Experienced DBAs and IT professionals share painful experiences of how coordinating multiple vendors for an upgrade took far too long while the business impatiently waited for a new solution. Dell EMC Validated Systems enable organizations to move from a complex DIY approach to a process of standardizing on a modern virtual infrastructure that is simple, manageable, and trusted. Validated Systems use converged infrastructure that meets certification, interoperability, capability, and supportability standards.

The goal of changing to a converged infrastructure is to minimize complexity of hardware management and testing by validating that all the components and software work together. The following figure shows three categories of converged infrastructure. Validated solutions have the broadest range of configuration options, the lowest pre-purchase engineering investment, and the largest customer investment in the build process. Validated solutions offer assurance that the compute, network, and storage components will work seamlessly together, but often the customer must deploy the system. Engineered systems and hybrid cloud platforms both have fewer configuration options but more tightly integrated components. Engineered systems are on the buy side of the spectrum because everything is pre-installed and validated before delivery.

Taxonomy of converged infrastructure

Validated solutions offer a balance between configuration flexibility and engineering validation that many customers prefer and that make them ideal for Oracle landscapes. DBAs can specify their requirements for a validated solution to accommodate any database workloads across the following hardware resources:

- Number of CPU cores and performance of CPUs
- Number of licensed CPU cores

- Server memory (RAM)
- Disk I/O, latency, and throughput
- Storage capacity
- Network connection speed

DBAs can get a tailored Dell EMC Validated System by working closely with their sales representative and using the System Builder collaboration tool. System Builder uses an interview-style interface to enable customers to easily define the infrastructure requirements for their database application needs. System Builder creates a documented Validated System infrastructure to ensure that the system meets the specified standards for data center compliance and capability. DBAs can then share the infrastructure configuration with the business, using it to redefine requirements as needed.

For example, suppose that a hybrid storage array is specified for a new application, but a review of proposed database workloads indicates that an all-flash storage system would be preferred. The DBA could then quickly update System Builder with the new, consistent configuration. The capability to collaboratively design, modify, and order a Validated System eliminates uncertainty and accelerates the configuration and ordering processes. Validated Systems for Virtualization are customizable so that customers can closely match database requirements to the new infrastructure.

Design flexibility: Oracle Database Standard Edition 2 scenario

Consider a scenario where a customer wants to deploy a new Oracle Database 12c Standard Edition 2 (SE2) database with a cost-effective virtualized infrastructure solution.

Oracle Database SE2 licensing rules specify:

- An SE2 database can be licensed on servers with a maximum of two sockets. A server socket is where the physical CPU resides on the backplane of the server.
- Each SE2 database is automatically capped to use a maximum of 16 concurrent user threads.

In System Builder, the lead DBA for the new database deployment specifies one production server and two test servers for the new environment and answers the following questions:

Question	Choices	Selection
How do you want the system deployed?	• DIY • Dell EMC Services • Dell EMC Services with Active System Manager	Dell EMC Services with Active System Manager
Preferred storage platform?	• Fibre Channel • iSCSI • Software defined	Fibre Channel: most common with databases

The DBA then specifies the number of cores, and the memory, storage I/O operations, and storage capacity requirements. System Builder uses virtual CPUs (vCPUs) for sizing the server compute resources. Most DBAs size servers using physical cores because Oracle licensing recognizes only physical cores. A simple equation of four vCPUs equaling one physical CPU is used to determine the number of physical cores. The DBA wants to maximize performance of the SE2 database by using 16 physical cores in the database servers. In this case, each server should be sized for 64 vCPUs, which

equals 16 physical cores. System Builder asks for the total aggregate. Thus, if three servers are planned for, 192 vCPUs (64+64+64) are needed.

Question	Instruction/choices	Selection
Number of virtual cores?	1 physical core equals 4 virtual CPUs	192
Total memory?	Input the amount of server memory in GB	192
Total storage capacity?	Input the required capacity in TB	3
Choose preference for storage?	• All Flash • Hybrid	All Flash

System Builder poses a few additional questions, but for brevity we have limited the questions to those that apply to this scenario. The recommended server and storage infrastructure is as follows.

Dell™ PowerEdge™ FC630 servers

The PowerEdge FC630 is a powerful server that supports Intel Xeon E5-2600 v4 processors and up to 1.5 TB of memory. The FC630 is a good fit for Oracle databases because it has a broad range of configuration options that enable the system to be designed for workload requirements. In this case, System Builder recommended the following configuration:

Server model	Quantity	Processor type	Memory per server
FC630	3	2 x E5-2680 with 14 cores each (total of 28 physical cores)	2 x 32 GB RDIMM

The production server will have a total of 28 cores. The first 16 cores will be reserved for the production database and the other 12 cores will be reserved for a copy of production. The other two servers, TEST1 and TEST2, will be used to support the copies of production.

Hyper-Threading

Hyper-Threading Technology is Intel's proprietary simultaneous multithreading (SMT) implementation that is used for parallelization of computations. In the *Oracle Databases on VMware Best Practices Guide*, VMware recommends enabling Hyper-Threading in the BIOS for Intel Xeon 5500 series and later processors. The guide notes that earlier processors showed no consistent measured performance results across applications, run environments, or database workloads.

Hyper-Threading is important to discuss because both Oracle DBAs and vSphere administrators will have different views about it. The following table shows how compute works with Oracle Database SE2.

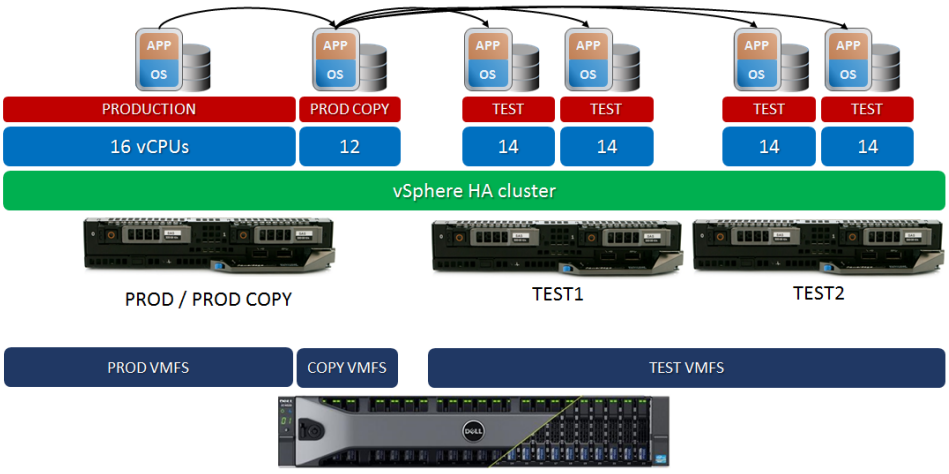
Hyper-Threading ON or OFF	Physical cores	Logical cores	vCPUs	Oracle SE2
ON	28	56	56	16 threads
OFF	28	Not applicable	28	16 threads

SE2 always limits the number of threads to 16 regardless of whether Hyper-Threading is turned on or off on the server. Currently, there is no research on the advantages or disadvantages of Hyper-Threading regarding SE2 on vSphere 6.0. To simplify discussion, Hyper-Threading is turned off for the scenario that is discussed in this brief, so the number of vCPUs equals the number of physical cores.

Dell Storage SC4020 all-in-one array

The SC4020 array offers high IOPS, low latency, and one of the lowest costs per gigabyte for all-flash storage, making it an ideal solution for Oracle SE2 databases. Using an all-flash storage array simplifies database storage design because the entire database benefits from sub-millisecond performance. In this example, the DBA is dedicating a VMFS datastore to production to maximize storage performance. The copy of production also has a dedicated VMFS datastore to ensure that backups and snapshots are fast. Finally, all test databases are grouped into a shared VMFS datastore to simplify storage management.

The DBA team plans to automate creation of a nightly copy of production using VMware snapshots and a backup of the production database from the copy. The advantages of offloading the backups to a copy of production include minimizing performance impact to production and having a copy of production that is never more than 24 hours old. The copy of production will also be used to create and refresh test databases. In this way, the DBA team can refresh a test database on demand without impacting production. The following figure shows how the DBA plans to use the Validated System for Virtualization to support the database environment.



Oracle Database SE2 database configuration

VMware vSphere High Availability

To ensure database uptime, the DBA plans to use a vSphere High Availability (HA) cluster with support for host monitoring and automatic restart of virtual machines (VMs) on a running server in the cluster. Many DBA teams choose vSphere HA as an alternative to Oracle RAC for high availability with VMware deployments of Oracle databases. For this example, the production and test servers have the same configuration so that both test servers can serve as temporary production servers. With matched hardware configurations for all servers, no production performance degradation will occur during the loss of one server. The strength of this HA design is the capability to have both production and test databases running in the event of an unplanned server outage, as shown in the following table.

Unplanned outage	Recovery scenario	Operational impact
Production server	PROD and PROD COPY are restarted on TEST1, and databases on TEST1 are live-migrated to TEST2.	Minor outage for PROD and PROD COPY. No disruption to test databases or slight performance impact.
Test server	Test databases are automatically restarted on surviving test server.	Minor outage for test databases and slight performance impact. Test databases are live-migrated back upon server recovery.

The vSphere administrator collaborates with the DBA to automate the unplanned outage scenarios. Using VM-Host affinity rules will prevent test databases from restarting on the production server. Using VM anti-affinity rules will force test databases to live-migrate to the other test server in the event of an unplanned production outage. Using vSphere HA, the DBA can automate the restart of databases and minimize disruption to the business.

Oracle SE2 licensing

As shown in the preceding figure, the Oracle DBA has assigned 16 vCPUs to the production database and 12 vCPUs to the copy of production. Oracle licensing does not restrict the number of cores on servers running SE2, so the core counts per two-socket server can increase over time without impacting the license obligation.

Using CPU affinity to pin the database to 16 cores is not required because SE2 limits the number of threads to 16. The only requirement is to use a server with two or fewer sockets on the backplane. Over-allocation of processor cores can cause a performance degradation, so the DBA, working with the vSphere administrator, limits the number of vCPUs to avoid the problem.

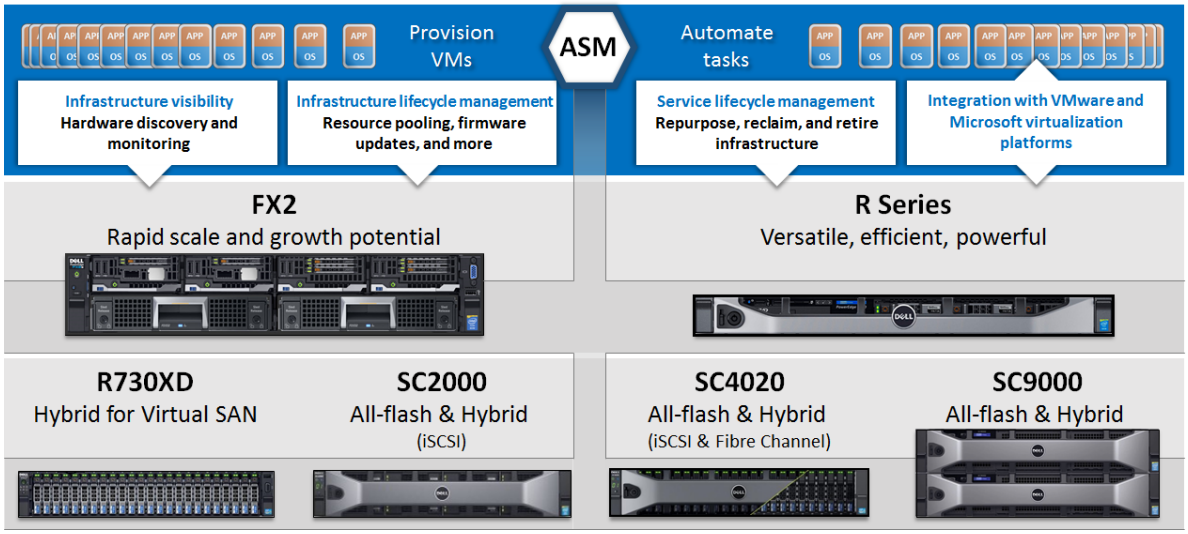
Benefits of Validated System for Virtualization

The preceding scenario is an example of how DBAs can use a Validated System for Virtualization to quickly and easily configure a tested virtual platform for a mission-critical database environment. The benefits of this solution include:

- Options for DBAs to configure a system to match their exact requirements including Oracle licensing requirements
- Access to a collaborative tool for working with Dell EMC to define CPU, memory, storage, and other requirements, and get a customized, supported configuration
- Acceleration of:
  - — Configuration and design using System Builder
  - — Infrastructure review while Dell EMC validates the system
  - — Deployment by electing to have Dell EMC Services install and configure the system
- Use of Dell PowerEdge servers with the power, memory, and flexibility for all database workloads
- Use of Dell SC4020 all-flash storage for submillisecond response times
- Tight integration with VMware vSphere for capabilities such as snapshots and HA

Automated lifecycle management of your Validated System

Active System Manager (ASM), not to be confused with Oracle ASM, is a tool that helps customers manage their Dell EMC infrastructure. ASM automates and streamlines key operational functions that are not typically covered in other technology stacks.



Active System Manager

ASM provides a unified dashboard through which IT organizations can gain visibility into their Dell EMC Validated Systems infrastructure. The entire infrastructure can be monitored through the dashboard and the status of any part of the system can be analyzed for fast problem identification and remediation. ASM improves lifecycle management and enables organizations to repurpose, reclaim, and retire infrastructure as needed. Through the ASM dashboard, resources can be combined, which can be especially important for database environments. Dedicating resource pools for some or all databases on a standardized infrastructure provides predictable performance and a more manageable environment for DBAs. ASM also can update firmware and ensure that the database resource pool is in compliance with enterprise standards.

ASM provides infrastructure visibility and control, facilitating the fast delivery of IT services to the business. VMware integration with ASM enables automation of many tasks through the virtualization layer. For example, DBAs can create and manage templates that can then be used to deploy database VMs, accelerating the provisioning of databases that match the needs of the application.

Summary

Most traditional data center expansions or upgrades start with the question of how many bids are needed for all the pieces of networking, storage, servers, cabling, and so on. Then everything eventually arrives, and someone has to start the rack, stack, cable, and test drill. When that work is done, the organization typically ends up with a data center that is full of equipment from a multitude of vendors. The result is an interoperability and support nightmare, including the need to wrangle multiple vendors onto a single call to try to resolve issues.

Dell EMC Validated Systems offer a solution with flexibility, simplicity, and efficiency that can be delivered quickly and at a lower cost for your Oracle databases. Our key focus is on streamlining a virtual infrastructure deployment that is tailored to your business needs. With Validated Systems, you can have the flexibility of a DIY approach without the associated complexity and risks.

Benefits of Validated System for Virtualization

Validated Systems for Virtualization provide the following advantages:

- **Flexibility**—The Validated System is a pretested modular stack of compute, networking, and storage that customers configure to address their workload requirements.
- **Simplicity**—Every phase of system design and implementation has been streamlined to reduce complexity and give customers complete control.
- **Accelerated time to value**—Every component of a Validated System has been tested and engineered for interoperability so IT organizations can deliver a virtual infrastructure faster than building it themselves.
- **Efficiency**—Validated Systems are enterprise-quality infrastructures that support automation of updates and lifecycle management through the use of ASM.
- **Lower cost**—Validated Systems provide lower TCO by eliminating traditional IT silos.

Our scenario demonstrates how easily and quickly you can configure a validated virtual infrastructure for Oracle Database SE2. With System Builder, the DBA had the flexibility to design the infrastructure to match database requirements and elected to have Dell EMC Services own the deployment. The IT organization gained further efficiencies by using ASM to remotely update and manage lifecycle activities from the central IT data center.

For more details about Dell EMC Validated Systems for Virtualization, contact your Dell EMC sales representative, who will work with you to understand your needs and help you design a better virtual infrastructure. It takes just minutes working with your sales representative and System Builder to produce a Validated System configuration. We encourage you to discuss the options that are available to customize the initial configuration that is based on your unique workload requirements. Your new system should be and can be tailored to your specific needs.

Contact us

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

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