Architectural Considerations for Creating High-Availability

VMware VirtualCenter Infrastructures

When implementing and maintaining a high-availability VMware® virtual infrastructure running on Dell™ PowerEdge™ servers and Dell/EMC storage, organizations should follow best practices and use key architectural design models. This approach can enhance management efficiency and help maximize uptime, resource utilization, and scalability in a virtualized data center environment.

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Server virtualization technology is maturing rapidly. As its benefits are demonstrated in a wide range of noncritical test and development scenarios, server virtualization is expected to expand into myriad production environments. When configuring virtual servers in a production environment, IT organizations may benefit from the many best practices that have been developed for traditional IT architectures. In fact, traditional IT best practices are expected to be extremely useful as they evolve to address virtualized IT environments.

Best IT practices for backup and recovery as well as high-availability (HA) strategies can be followed when implementing a virtualized IT environment. For example, in a VMware-based virtual IT infrastructure, systems running VMware ESX Server™ software can be backed up using traditional approaches for backup software, and virtual machines (VMs) residing on ESX Server–based hosts can be clustered using traditional clustering software.

Similar best practices should also be applied when implementing VMware VirtualCenter software, a key component of the VMware virtual infrastructure. VirtualCenter is an application that runs on the Microsoft® Windows® OS and is designed to manage hundreds of ESX Server–based hosts from a central console. Using the VirtualCenter interface, administrators are enabled to create, deploy, and clone VMs; obtain status and performance metrics for ESX Server–based systems; and execute dynamic migration of VMs between different physical ESX Server–based hosts using VMware VMotion™ technology.

Because VirtualCenter relies heavily on an operational database to support and maintain the ESX Server–based hosts and the VM configuration and performance data, implementing this database in an HA configuration can enhance the flexibility, uptime, and scalability that a virtualized enterprise infrastructure is designed to provide. However, the VirtualCenter database is not the only

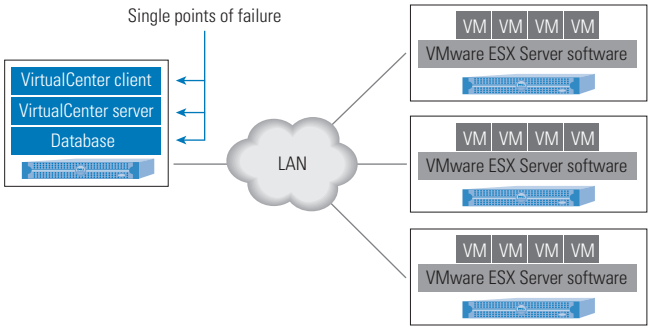

Figure 1. Stand-alone VirtualCenter model

potential single point of failure. Operations and tasks can be scheduled from VirtualCenter for action on VMs or ESX Server–based hosts; if a VirtualCenter server fails, the ensuing downtime may lead to an undesirable impact on business operations. By using key architectural design models and following IT best practices, organizations can enable successful implementations designed to maintain a high-availability VMware virtual infrastructure.

Examining the VirtualCenter design models

IT administrators can choose from four key architectural design approaches for deploying VirtualCenter: the stand-alone model, the distributed model, the HA model, and the virtualized clustered HA model. While the stand-alone model does not represent a true HA system, it provides for a rigorous backup and archiving method that may be well-suited for small data centers or initial virtualization deployments. While the distributed model also does not represent a true HA system, its two-node design for VirtualCenter and its database enables availability enhancements over the stand-alone model.

As business demands grow and virtual infrastructure requirements expand, implementing true HA models can help ensure maximum uptime and resource utilization in a virtual IT infrastructure. For example, one HA VirtualCenter design model uses an active/passive HA configuration for the VirtualCenter component stacks, while another HA model implements a clustered virtual infrastructure model for VirtualCenter and its database.

Stand-alone VirtualCenter model

The stand-alone model for VirtualCenter, shown in Figure 1, is the simplest of the four models to design and implement. In this configuration, VirtualCenter software stack components reside on the same physical server. However, this centralized design means that individual stack components and the underlying server are all potential single points of failure.

The VirtualCenter client can be an important tool for configuring and managing ESX Server–based hosts and VMs, but it does not have to be running for normal VirtualCenter operations to occur. Because the VirtualCenter client is the primary interface for the VirtualCenter server, a failed VirtualCenter server or database component stack can render the VirtualCenter client ineffective until the failed component is recovered.

Another disadvantage of the stand-alone model is the downtime encountered if a VirtualCenter server or database system fails. Depending on the type of failure, recovery time could involve not only the database, but also the systems that host the VirtualCenter software stack components. For example, if a bare-metal VirtualCenter software stack must be restored, it may take administrators several hours to reinstall the OS, database application, and VirtualCenter software and then to restore connectivity to the managed ESX Server–based host and VM resources. During the recovery and restoration period, the ESX Server–based infrastructure could be left in an unmanaged state.

Distributed VirtualCenter model

While supporting the same component stack specified for the stand-alone model, the distributed VirtualCenter approach enables a higher degree of availability than the stand-alone model by creating a tiered relationship between the database server and clients. In this distributed scenario, two servers support the VirtualCenter infrastructure—the VirtualCenter stack components (the client and server) and the database reside on completely separate systems. The VirtualCenter server communicates with the database server using an Open Database Connectivity (ODBC) connection. ODBC is a method that enables applications to communicate with a database server.

A distributed architecture helps reduce the risk of losing the entire VirtualCenter infrastructure, but it does not yet create a highly available infrastructure if hardware or software components fail. As Figure 2 shows, single points of failure still exist in this model. A failed database or VirtualCenter server still leaves the ESX Server–based systems and the VMs they host in an unmanaged state (VirtualCenter will not be operational) until the problem is resolved. In addition, if VM template files reside on a failed VirtualCenter

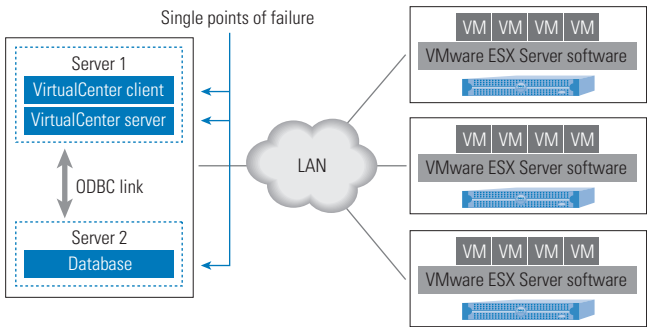

Figure 2. Distributed VirtualCenter model

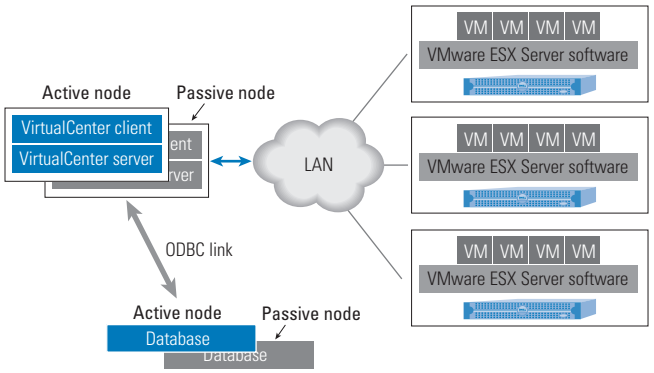

Figure 3. High-availability VirtualCenter model

server, those template files will not be available for scheduled cloning tasks until the VirtualCenter server is recovered. And if the VirtualCenter server is the sole repository for the template files, then master VM template files may not be recoverable unless the VirtualCenter server is regularly backed up.

High-availability VirtualCenter model

In addition to what the stand-alone and distributed VirtualCenter models offer, the HA model is designed not only to reduce the risk of losing the entire VirtualCenter infrastructure, but also to help eliminate the possibility of downtime if certain hardware or software components fail. Figure 3 shows an HA VirtualCenter model that is designed to eliminate single points of failure.

If one or both of the active VirtualCenter or database nodes fail, the corresponding passive node for each is designed to immediately assume operations, enabling the VirtualCenter stack components (the client and server) to maintain connectivity. This resilient configuration helps ensure maximum uptime without interruption in service for ESX Server–based hosts and VMs during the recovery period in which replacement passive nodes are brought online.

For an HA system to provide maximum uptime, however, a robust and fault-tolerant storage system—for example, a storage area network (SAN) based on a Dell/EMC CX series storage array—is required. Dell/EMC storage arrays such as the CX300, CX500, and CX700 can be used as SAN platforms and are well-suited for supporting mission-critical database systems that house data for vital applications such as VirtualCenter. In addition, an IT organization deploying an HA VirtualCenter model can enhance the capabilities of its SAN infrastructure by using the advanced VMotion feature of VirtualCenter. VMotion is designed to move VMs from one physical ESX Server–based host to another physical ESX Server–based host while maintaining VM and application functionality. By deploying an HA VirtualCenter model and using VMotion technology, organizations may enable maximum uptime and functionality from their VMware ESX Server–based virtual server deployments.

Virtualized clustered high-availability VirtualCenter model

Some or all of the VirtualCenter components described in the preceding sections can be virtualized. For example, the VirtualCenter server can be installed on two VMs that are clustered together for high availability. Similarly, database components can be installed on clustered VMs.

Administrators may consider several options for clustering in virtualized data center environments. For example, the cluster can comprise two VMs on a single ESX Server–based physical server, two VMs on two different ESX Server–based physical servers, or one cluster node deployed as a VM on an ESX Server–based physical server and the other cluster node deployed as a physical server. By deploying VMs in a cluster configuration, IT organizations may achieve inherent advantages enabled by virtualization technology—that is, normalized performance, OS and application isolation, resource consolidation, and management efficiency.

Building a resilient virtual infrastructure

A high-availability VMware VirtualCenter configuration can be designed to enable an always-on virtualized enterprise IT infrastructure. By understanding and implementing best-practices methods and key architectural design models for virtualized data center environments, IT organizations may enhance management efficiency and help ensure maximum uptime, resource utilization, and scalability for their enterprise infrastructures.

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