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Managing Your Virtualized Environment: Migration Tools, Backup and Disaster Recovery

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Migration to Open Source Virtualization

Open source virtualization will fit well in many organizations. One of the first considerations is how to migrate from currently deployed hypervisors to an open source platform. There are multiple ways to deploy virtualization and, in some cases, the best option is a combination of multiple hypervisors. In order to realize the greatest benefit of open source virtualization, you should keep in mind a number of factors:

- Ways of deploying virtualization
- Technical features to assess in virtualization platforms
- Management features to asses in virtualization platforms
- Use of backup solutions to support migration

By weighing the relative importance of features against your requirements, you should be able to find a combination of virtualization platforms and migration procedures that fit your needs.

Ways of Deploying Virtualization

Virtualization has fundamentally changed the way we deploy applications and deliver services. It has decoupled applications and even desktops from hardware. In the process, it has created operating system (OS) environments that are sufficiently removed from hardware dependencies that we no longer need to think in terms of one server to one application. Instead, we can think of servers as a pool of resources for running virtual machines. VMs can move between physical servers as needed to optimize performance, consolidate VMs, and minimize the number of physical servers running at any time.

The ability to decouple an OS from dedicated hardware promotes at least three ways of deploying virtualization:

- Virtualized servers
- Private computing clouds
- Virtual desktop infrastructure

These deployments implement a wide array of services that all use the same fundamental technology.

Virtualized Servers

When a single physical server is used to run multiple OSs, we call that a virtualized server. You deploy virtualized servers when a physical server has more capacity than is needed by a single application or set of applications that would run on a single instance of an OS. For example, you might have a lightly-used collaboration server and a moderately-used employee portal that you need to deploy. One runs under Windows while the other runs under Linux. Neither requires the full capacity of one of your servers. This scenario is typical for a virtualized server.

Private Computing Clouds

Private computing clouds extend the way we think about virtualized servers. A computing cloud (or simply "cloud") is a set of servers and supporting infrastructure dedicated to running VMs. In the virtualized server model, we tend to run the same VMs for extended periods of time, such as months or years.

Clouds support more frequent changes in the number and type of VMs deployed. For example, a retailer might update their data warehouse every night. Stores upload their daily transactions to a staging area where the data is processed and loaded into the data warehouse. This setup creates a peak demand for computing resources at night with no demand during the day. Rather than dedicate servers to this process, a better model is to deploy VMs during the demand period and then release the physical servers to run other jobs during the day. Cloud infrastructure is optimized for this kind of frequent change in VM deployment.

Virtual Desktop Environments

Virtualization technology works well with desktops as well as servers. One way to work with a virtualized desktop is to run a hypervisor on the desktop and host two or more OSs. This setup may be appropriate for developers or others who can make use of multiple OSs on the same desktop. Another practice provides virtual desktops to client devices while running the desktop OS on a server in a data center. This configuration can be especially appealing to businesses whose employees want to work with personal laptops, tablets, and smartphones. With virtualized desktops, centralized IT can configure VMs for desktops with all the security controls they require.

Virtualization platforms are commonly used to virtualize servers, and the rate of adoption of cloud computing and desktop virtualization is increasing. As you consider how you will use virtualization, be sure to evaluate the technical features of the platforms.

Technical Features to Assess in Virtualization Platforms

There are a range of technical features that can distinguish virtualization platforms. Some of the most important are:

- Cross-platform support
- Performance and scalability
- Security
- Live migration support
- High availability
- Additional advanced features

Some of these features may be more relevant to your requirements than others; their importance should be weighted accordingly.

Cross-Platform Support

Hypervisors used for server virtualization should support multiple OSs on the same physical server. One of the advantages of virtualization is that it allows you to arrange multiple VMs across servers to optimally load each server. Being constrained to running only a single type of OS on a hypervisor reduces the chances of finding an optimal configuration of VMs.

Performance and Scalability

One of the ways to measure performance of a hypervisor is to compare it with a direct implementation on a bare metal server. For example, if you can run a database application benchmark in 100 seconds on a database deployed to an OS running directly on a server, and that same benchmark takes 120 seconds when deployed to a comparably configured VM, you have a 20% performance penalty. For obvious reasons, you want to minimize this penalty.

Scalability is also a key consideration. The more VMs a hypervisor can support, the better the scalability. It is not unusual to have virtual servers that place minimal demand on underlying hardware. In such cases, it makes sense to run as many of these low-utilization VMs as possible on a single server. If the hypervisor requires substantial overhead for each VM, scalability will be limited.

Security

Most security controls will be implemented at the OS level, but security is still an issue for hypervisors. It is important to logically isolate VMs so that an adverse event on one of the hosted VMs does not affect any other VM running on the same physical server.

Live Migration Support

The load on servers running VMs will change over time. In especially dynamic environments, there might be physical servers with multiple VMs running heavy loads while other servers have relatively light loads. Ideally, the virtualization platform would allow VMs from one server to migrate to another server without shutting down the VM. With this type of support for live migration of VMs, resources can be continuously reconfigured for optimal performance. Migrating VMs can also result in better consolidation so that fewer physical servers have to be running at the same time, saving on power and potentially cooling costs.

High Availability

Businesses that depend on the constant availability of applications and services should assess the high-availability features of virtualization platforms. Hardware fails and OSs hang. Virtualization platforms that can detect hardware and OS failures and automatically restart VMs on other hardware can enable high-availability services.

Additional Advanced Features

In addition to high-level technical features, such as high availability and security, there are lower-level implementation details that should be considered:

- Advanced memory management features
- Network interface card (NIC) teaming to share traffic between physical and virtual networks across multiple NICs
- Support for multipathing, allowing for data transfer paths to storage
- Power management features to reduce power consumption when possible
- Hardware and guest OS certification

Given the complexity of virtualization platforms, it would be understandable to focus on technical features as the prime differentiator between your options. That would be a mistake. Be sure to consider the management features as well.

Management Features to Assess in Virtualization Platforms

The day-to-day operations in a virtualized environment will have as much impact on the business bottom line as many of the technical features. Look for virtualization platforms that provide:

- Management console
- Self-service support
- Operations automation

The objective of this assessment is twofold: first, to determine what parts of day-to-day operations can be automated and second, understand what features are in place to streamline the remaining manual tasks.

Management Console

A management console is a particularly important tool for systems administrators. This console should provide a single point of access for managing VM images, monitoring performance, viewing reports, and responding to alerts.

VM image management can be time consuming without proper tools. Images will need to be patched from time to time. New images will be added to the image catalog and others will be removed. A management console should support searching metadata associated with images (for example, OS version or patch level) so that administrators can quickly isolate particular images.

Self-Service Support

The more end users can do for themselves, the better. Self-service reduces IT administration costs. It can also improve the response time between recognizing the need for a change and the time to actually finish implementing the change. Self-service features should be made available on an as-needed basis. A user's role in the organization should dictate their level of access to support functions. For example, developers might be granted the right to create a new VM image while most other users are not.

Operations Automation

Operation automation features overlap with some of the technical features described earlier. Some of the most significant are:

- Load balancing
- Power savings
- Image management
- Network and storage management

These automation features can significantly influence the cost of ongoing operations. Load balancing in conjunction with power-saving features can optimize the number of servers running at any time. Image management features can help ensure that images are cloned rapidly and snapshots are created and stored in case you need to roll back to an earlier state of the machine image.

In the likely event that existing management features and reporting do not meet all of your needs, you might be able to implement a custom solution if a centralized API is available. Be sure to assess the functionality provided by the virtualization platform's API. Organizations that make use of multiple virtualization platforms can realize further savings by streamlining migrations with the right backup solution.

Using Backup Solution to Support Migration

Backup solutions designed to support VMs can be particularly useful for migrations. You might be migrating from physical as well as virtual servers, so look for backup solution that can migrate:

- Physical to virtual servers (P2V)
- Virtual to virtual servers (V2V)
- Virtual to physical servers (V2P)

The next article in this series will delve into detail about the need for virtualization-aware backups and key backup technical features to consider.

Summary

Migrating to open source virtualization presents a number of opportunities. These choices are driven in part by the different ways you can deploy virtualization—for example, as server virtualization, private clouds, or desktop virtualization. When migrating to or adopting another virtualization platform, consider both the technical and management features provided.