

Closing the Virtualization Loop

How to Improve Your Virtual Machine Backup and Recovery Now



An Acronis White Paper

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Virtualization has progressed from an emerging early adopter technology to a mainstream business necessity at a record pace. Nearly half of all small, medium and large enterprises worldwide are considering implementing some amount of virtualization within their IT environment.

It's also expected that virtual machines will continue to supplant dedicated physical servers until all the servers that can be virtualized, will be. It's likely that the only dedicated physical servers that will continue to exist will be for applications that require dedicated computing resources - and even those servers might be encapsulated as a single, rapidly moveable virtual machine.

The reasons are obvious. Virtualization Return on Investment (ROI) is almost instantaneous because multiple underused physical servers are replaced by virtual machines resident upon a single physical host. It also reduces IT resource Total Cost of Ownership (TCO) because instead of applying dedicated resources (servers, storage, etc.) to applications that don't use them fully, existing resources are used more fully, reducing the amount of capital investment required.

The capability to dynamically repurpose and migrate virtual machines is their other chief consideration. Virtualization enables rapid deployment of an application server environment without extensive server configuration. All of the server resources and settings required for the application are packaged within the virtual machine container.

As the chapter closes on the first generation of Virtualization technology, the following two questions have been asked – 1) what do we need to do to complete our virtualization implementation loop and 2) what's in store for the next generation of virtualization?

The Acronis Global Disaster Recovery Index

Acronis recently commissioned a study by the Ponemon Institute, an international research firm and respected think-tank on data protection trends. The survey is based on responses from over 3,000 IT practitioners in Australia, France, Germany, Hong Kong, Italy, Japan, Netherlands, Norway, Singapore, Sweden, Switzerland, the United Kingdom and the United States. The index research was developed across a broad range of industries and was conducted among small and medium-sized businesses with less than 1000 seats.

The Index was created from the rankings of aggregated responses to eleven questions asked of each participant about their backup and Disaster Recovery (DR) readiness, capabilities and practices. The results were then grouped geographically. The questions gauged IT managers' confidence in their DR policies based on their ability and willingness to adopt new technology, confidence in their procedures and policies, level of executive support, and their ability to recover rapidly after downtime.

The one point upon which IT managers in all countries throughout the world agreed is that they all want a single backup and DR solution that can easily and reliably span the needs of their hybrid physical, virtual, and cloud environments. This encompasses the ability to manage physical server and workstation systems, virtual machines, and cloud resources using a common framework contained within a single pane of glass.

The key Disaster Recovery Index finding for virtualization indicates that the leading adopters of virtual machines top the Index and that they back up their virtual machines more frequently than organizations that score lower. One of the reasons cited by organizations with lower virtual machine backup rates is the complexity created by using different backup applications for physical and virtual machines.

Traditional physical server backup solutions have, for the most part, proven to be inadequate for virtual machine backup. Many are agent-based, which means that an agent application is required and consumes precious virtual machine processing resources. According to ITManagement.com , physical servers that host virtual machines are frequently “between 60 percent and 80 percent. Doing the math, that’s a 3:1 or 4:1 consolidation ratio, though some companies have reported consolidation ratios as high as 12:1”. Simultaneous initiation of agent-based backups can cause serious virtual machine disruptions, including total failure of the underlying physical host.

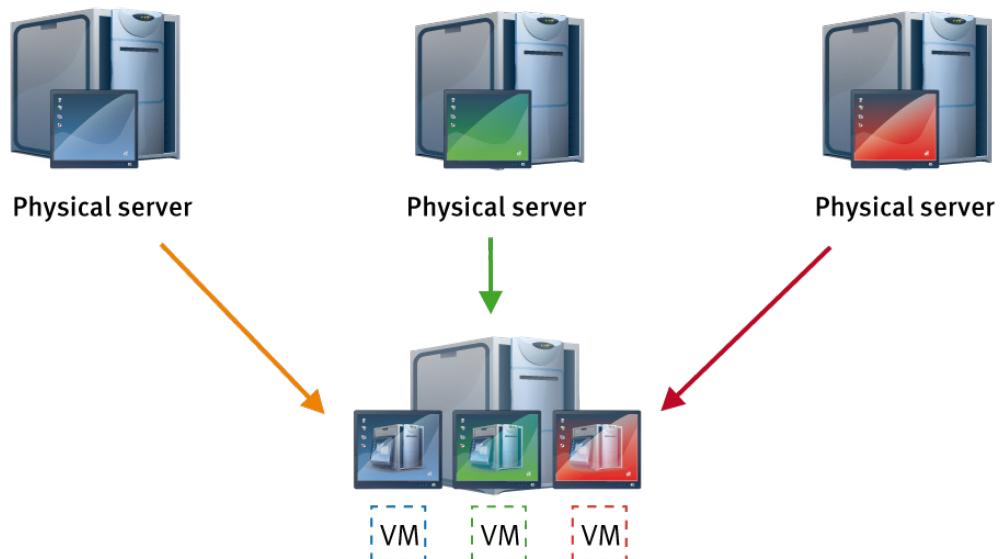
Compromised virtual machine backup solutions have been created to address these problems. One such solution is SAN-based backup using a proxy backup server which offloads the backup operation from the virtual machines. This solution however, requires a dedicated proxy server, large shared storage resources for snapshots, and has proven to be complex to manage. It’s very expensive to implement both the SAN and to allocate the additional snapshot storage resources. In addition, customized scripts are sometimes required to ensure proper implementation.

Closing the Virtualization Loop

To close the loop on virtualization efforts, a backup and disaster recovery strategy as robust as that deployed for physical servers is required for all virtual machines, especially if the virtual machine supports a production application. Management of virtual machine resources should both be integrated with physical server and cloud resources and procedures should be as similar as possible for all three environments.

Also, to provide the fastest possible virtual machine Recovery Point Objective (RPO), in the event of a failure or other difficulty, each virtual machine should be independently backed up and frequently refreshed. This is to ensure that recovery can be as granular and specific as possible.

Diagram 1 - Physical to Virtual Server Consolidation



The New Virtualization Paradigm

The Next Phase of Virtual Machine Backup and Recovery

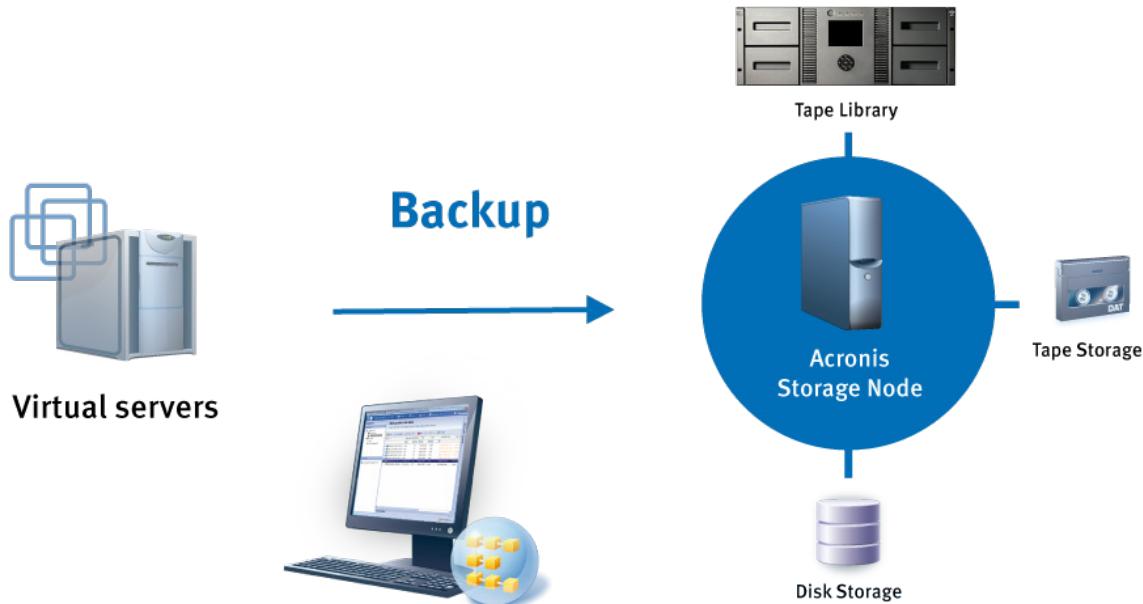
As virtualization continues to increase in popularity and become entrusted as the primary production server platform, a number of key considerations must be taken into account for the next generation of virtualization technology. They're identified in the Virtualization Backup and Recovery Next Phase Objectives section below.

Virtualization's first generation was fueled by server consolidation to make better use of server resources and reduce the number of physical servers required to meet current processing demands, thus creating an immediate ROI and a significantly reduced TCO.

The next phase of virtualization technology should include integrated backup and recovery designed to suit the demands of virtual environments, including Bare Metal Recovery (BMR). It should also include dynamic mobility - P2V, V2V, V2P, P2P, P2C, V2C, C2V, C2P and comprehensive single pain of glass management of the Physical, Virtual, and Cloud resources along with backup and disaster recovery embedded as integral components.

Omitting one or all of these requirements won't make your virtualization initiative a failure, but it will reduce your ability to reap the highest benefits from your virtualization implementation. It will also make the implementation, management, and protection of your virtual infrastructure much more complicated and less reliable.

Diagram 2 - Comprehensive Virtual Machine Backup



The Next Phase of Virtualization Technology Objectives

The objectives for the next phase of virtual backup and recovery technology should include, but are not limited to:

- Management of virtual, physical, and cloud environments must be common, all-encompassing, and highly integrated.
- Virtualization backup should be integrated in the design of the virtualization plan - not as an afterthought.
- P2V migration and unlimited V2V migrations, as well as V2P migrations should be supported within one framework to provide the fastest resource allocation and redistribution possible.
- Virtualization should be used as a tool for Disaster Recovery and Disaster Recovery should always be integrally combined with Virtualization.
- Universal Migration for virtual machines between different server types should be the norm

Virtualization Backup and Recovery Next Phase: Objective 1 - Management of virtual, physical, and cloud environments must be common, all encompassing, and highly integrated.

This conclusion was unanimous and voiced the loudest in Disaster Recovery Index survey results. IT centers, especially those in small and medium-sized businesses, are struggling with the difficulties created by using different software solutions for physical, virtual and cloud backup operations.

They may also be burdened by the resource expense and implementation difficulties associated with using backup software designed for physical servers to do virtual machine backup. They may also experience additional licensing, training, and support costs by using multiple, different software products to manage a complex physical, virtual, and cloud environment. In some cases, the additional costs could end up being so high that they significantly reduce or even eliminate the Total Cost of Ownership benefits gained through server consolidation. There has to be a better way and there is.

Diagram 3 - Virtual machine Recovery



Virtualization Backup and Recovery Next Phase: Objective 1 Fulfillment - Easy to Manage Centralized Universal Management

Acronis has designed Acronis® Backup & Recovery™ 10 to span Physical, Virtual, and Cloud backup and recovery with a unified user interface and common procedures regardless of the platform or location. The same management screen, or pane of glass, is used for Physical, Virtual and Cloud procedures so that new methods do not need to be learned and best practices can be established and then repeated.

With Acronis Backup & Recovery 10, management is based upon common policies that can be applied to physical, virtual, and cloud environments, and is not based purely upon the platform or environment. Certainly, there are differences between the procedures that occur on the platform or within the environment, but they are subordinate to the management procedures that are common across all of the platforms and environments.

Virtualization Backup and Recovery Next Phase: Objective 2 - Virtualization backup integrated into the virtualization plan design - not added as an afterthought

The first generation of server and workstation virtualization was not about backup. In fact backup was only integrated more closely after data centers tried to use agent-based physical server backup software and found that the backup software had a severe impact on both the virtual machine and underlying physical host.

This is especially true if multiple virtual machine backups are initiated simultaneously on the same physical host. In some cases, and dependent upon the physical host loading, the physical host would actually crash when multiple virtual machine backups were initiated.

As a compromise solution, agent-based backup software has been adapted to work with proxy servers using snapshots, which has reduced the overhead on the virtual machines but has required significant network bandwidth, proxy server resources and customization to work. This circumstance isn't unusual and can be considered a hidden cost associated with server virtualization. In every case, these additional costs elongate the ROI payback period and increase the virtual solution's Total Cost of Ownership (TCO).

Virtualization Backup and Recovery Next Phase: Objective 2 Fulfillment - Integrated Virtual machine Backup

Acronis Backup & Recovery 10 Advanced Server Virtual Edition provides virtual machine backup technology that was designed as agentless from the start. Instead of requiring that each virtual machine have a backup agent, or that an expensive proxy server with snapshot space be provided for backup, Acronis Backup & Recovery 10 Advanced Server Virtual Edition only requires one agent per physical host that can support unlimited virtual machines on the host.

The Acronis Backup & Recovery 10 Advanced Server Virtual Edition design is highly efficient in its minimal requirements for agent footprint, network bandwidth, and storage resources. Acronis Backup & Recovery 10 Advanced Server Virtual Edition does not require snapshot resources, uses network performance management, and requires only one backup agent per physical host.

Virtualization Backup and Recovery Next Phase: Objective 3 - P2V migration and unlimited V2V migrations, as well as V2P migrations should be supported within one framework to provide dynamic virtual resource allocation and redistribution

The foremost benefit of virtualization is server consolidation – where multiple virtual machines on a physical host replace multiple underused physical servers. A second and increasingly important benefit is virtual machine migration, especially within clustered server environments and for disaster recovery purposes.

The server consolidation process usually consists of both a physical to virtual machine conversion phase and a virtual machine migration – where the newly created server is consolidated along with other virtual machines on a different physical host. This enables the source physical server to then be repurposed, used as a standby server, or to be retired.

Virtualization Backup and Recovery Next Phase: Objective 3 Fulfillment - P2V, unlimited V2V, and V2P migrations in one package

Acronis Backup & Recovery 10 Advanced Server Virtual Edition supports unlimited V2V, P2V, and V2P migration in one package. P2V migration enables smooth, seamless server consolidation and unlimited V2V migrations enable the swift movement of virtual machines for repurposing without requiring that the storage resources be on a SAN.

V2P migration is a distinctive capability in that it provides the flexibility to restore a virtual machine to a physical server if the server application requirements change. An example might be a circumstance where the application requirements change so that direct, deterministic performance access and control of the physical server network, memory or storage resources is required. V2P enables the conversion of the virtual resources back into physical host resources to accommodate this requirement.

For disaster recovery, V2V migration can be used to prepare a standby virtual machine that can be immediately started if a problem occurs with the production server. Acronis Backup & Recovery 10 Advanced Server Virtual Edition provides a capability called Instant Restore which enables a standby virtual machine to be immediately started in the event of a production virtual machine failure.

Acronis Backup & Recovery 10 Advanced Server Virtual Edition is provided as a single solution that seamlessly spans Physical, Virtual, and Cloud environments. V2V, P2V, and V2P migrations may be done not only between servers in a data center location or between data centers, but also into a Cloud environment. This enables the ultimate dynamic resource migration flexibility while still being managed from a single, unified management console.

Virtualization Backup and Recovery Next Phase: Objective 4 - Disaster Recovery should always be integrally combined with Virtualization and Virtualization should be used as a tool for Disaster Recovery

Backup and disaster recovery protection should be provided for every virtual machine that runs a critical application requiring protection. Protecting the physical host on which virtual machines reside enables some level of protection, but is inadequate for providing granular and predictable disaster recovery. Individual file, folder, or user recoveries are much more difficult to accomplish if only the physical host and not the individual virtual machines is protected.

Virtualization Backup and Recovery Next Phase: Objective 4 Fulfillment - Integral, award-winning virtual machine backup and recovery

Backup and disaster recovery protection are the award winning foundation of Acronis Backup & Recovery 10. It has been optimized for high performance bare metal image creation as well as for selective file-level backup. Recovery has been optimized to be high speed for full disk reimaging as well as individual file or folder restoration.

This is the foundation of Acronis' virtualization technology, not something added later or achieved through a combination of incompatible software products. Acronis Backup & Recovery 10's high level of design integration and performance optimization make it a superior solution for virtual machine backup and disaster recovery compared with other products that have been reverse-engineered to attempt to accommodate virtual environments.

Virtualization Backup and Recovery Next Phase: Objective 5 - Universal Migration for virtual machines between different server types should be the norm

With almost every virtual environment and backup solution, migrations must take place between similar physical hosts. That means that the processor version, firmware revision, mass storage drivers, and the like have to be the same on the target physical host, or the virtual machine will not be bootable.

Migration utilities that provide a Hardware Abstraction Layer are inadequate to ensure bootable compatibility. This limitation severely limits the flexibility most organizations want for moving computing resources dynamically and using them for disaster recovery or load balancing.

Virtualization Backup and Recovery Next Phase: Objective 5 Fulfillment - Universal Migration

Acronis Backup & Recovery 10 Advanced Server Virtual Edition's Universal Restore capability makes Universal Migration possible and is a superior alternative and enhancement to Hardware Abstraction Layers and other virtual machine movement utilities in that it allows migration to different platforms with dissimilar hardware and software versions, including the capability to do bare metal recovery on the target server.

Conclusion - Achieving a Highly-Available Services-on-Demand IT Environment

Now that virtualization technology has reached mainstream status, organizations should consider how to complete the technology capability for their virtual resources in order to establish a services-on-demand infrastructure and achieve the maximum benefit from it. Every critical application virtual machine should have a disaster recovery plan or at least a set of guidelines documenting how to recover from a server crash in order to ensure that the services are continuously available.

Looking forward, organizations should evaluate not only what they need to do to take full advantage of their virtualization technology. Server consolidation is, of course, the most obvious goal of a virtualization effort. But, the capability to dynamically migrate virtual machines enables you to dynamically allocate resources as you need them without having to use SAN-based storage. This means that virtual machines can be migrated from server to server in any environment – SAN-based or non-SAN-based.

Acronis Backup & Recovery 10 Advanced Server Virtual Edition, which is functionally integrated with VMware Vmotion, enables unlimited movement of virtual machines over any network, not just a SAN. With Acronis Backup & Recovery 10 Universal Restore, recovery can take place over any network connection and does not require a specialized network storage implementation. This provides greater overall configuration flexibility and increases the ways in which virtualization technology can be used.

Organizations should also mandate unified management of physical, virtual and cloud resources. With a product family such as Acronis Backup & Recovery 10, there is absolutely no reason why your organization should have to struggle with and incur the additional operating expense of using different software products to manage their physical, virtual and cloud environments.

Disaster recovery and server consolidation for virtual machines should be as well planned and designed as it is for physical servers. As virtual machines assume the role of mission-critical application servers they should have the same level of robust backup and recovery protection as the physical server. Protecting a physical host will protect the virtual machines it contains but it will not enable the rapid RPO and RTO recovery times that protecting each virtual machine individually provides.

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