Zertø

Hypervisor-based Replication

A New Approach to
Business Continuity/
Disaster Recovery

Zerto has revolutionized the industry with a virtual-aware, software-only, tier-one, enterprise-class replication solution purpose-built for virtual environments.

Virtualization of the data center has proven to be a true IT game-changer, providing increased flexibility and control in managing production workloads, as well as significantly streamlining the implementation and operational support. Organizations continue to expand their virtualization initiatives to private, public and hybrid cloud environments.

To more fully realize the benefits of virtualization and get the most out of their investments in the technology, organizations need to optimize all IT processes and activities for their virtual environment. This includes security, compliance, and Business Continuity/Disaster Recovery (BC/DR). Of the three, BC/DR is perhaps the most difficult because to date there have been no virtual-ready remote replication methods that organizations could adopt. That is all about to change.

BACKGROUND

Until now the most common replication technologies and methods essential to mission-critical BC/DR initiatives have been tied to the physical environment. Although they do work in the virtual environment, they aren't optimized for it. Physical hardware dependency undermines the benefits of virtualization and leads to significant operational and organizational challenges. Among them:

- If a replication solution isn't virtual-ready, management overhead could be more than doubled; many of the benefits achieved through virtualization, therefore, could be lost in the disaster recovery sphere.

- Virtualization is scalable, but today's BC/DR methods are not. Customer data is always growing, so a company can find its information inventory expanding exponentially and not have a replication solution to keep pace.

- In an increasingly heterogeneous IT environment, some replication methods remain firmly tied to a single vendor and hardware platform, limiting the organization's ability to get the best solutions – and service – at the best price.

Clearly, there was a critical need for BC/DR to become aligned with the promise and reality of virtualization in the data center. Competitive and compliance-related

pressures are at an all-time high, and organizations need every advantage to ensure excellence in their BC/DR capabilities. With the introduction of hypervisor-based replication, Zerto elevates BC/DR up the infrastructure stack where it belongs: in the virtualization layer.

Not only are today's array-based, guest/OS-based, and appliance-based replication technologies not optimized for the virtual environment, most were developed specifically for use with physical IT assets. As such, all three have issues that inhibit the efficiency and effectiveness organizations require. A brief review of the structures and limitations of these methods will help to amplify the advantages and benefits of Zerto's virtual-ready, hypervisor-based replication solution.

Array-based Replication: Insufficient Granularity

Array-based replication products are provided by the storage vendors and deployed as modules inside the storage array. They are single-vendor solutions, compatible only with the specific storage solution already in use. Legacy solutions, such as array-based replication does not have the granularity that is needed in a virtual environment.

- Relationship between the VM and storage is fixed, eliminating the flexibility of the virtual environment

- Entire LUN is replicated, whether it is 40% of 90% utilized – increasing power, cooling and storage costs
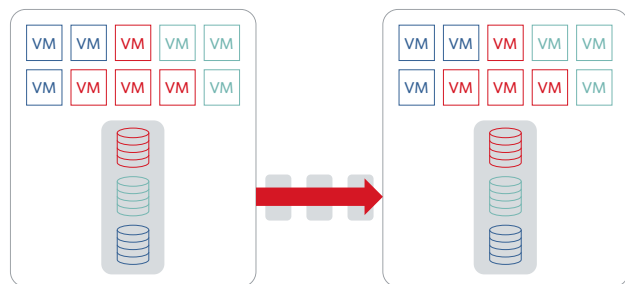
Array-based replication requires strict relationships between the virtual and storage environment, undermining the investment in virtualization.

Array-based replication has other important disadvantages as well, such as:

- It is designed to replicate physical entities rather than virtual entities. It doesn't "see" the virtual machines and is oblivious to the configuration changes. Due to their dynamic nature, virtual environments have a high rate of change. As a result, BC/DR plans will be out of sync with the current production environment.

- It requires multiple points of control: in addition to the physical storage array's management console, IT also is managing virtual assets from a virtualization management console, such as VMware's vSphere Client.

- Though optimized to work with an organization's existing storage array, it locks in the organization to a single vendor. There is no flexibility to try new storage arrays, reducing the opportunity for innovation.

" When we purchased the software, we knew it would improve our BC/DR process, but we got so much more. We reduced our storage footprint by more than 40%. We never expected that. Now, we do not have to purchase storage for the foreseeable future, which is a huge savings for us."

— Bill Rausch, Software Engineering Manager, HAPO Community Credit Union

Guest/OS-based Replication: Impossible to Scale

Guest/OS-based replication solutions comprise software components that have to be installed on each individual physical and virtual server. Although much more portable than array-based solutions, guest/OS-based replication solutions are not fit for enterprises for the following reasons:

Host-based replication requires an agent on each VM, greatly increasing complexity.

- The requirement to install a module on every single server limits scalability and makes it impossible to implement and manage in high-scale enterprise environments.

- Shadow VMs are often part of the implementation, putting increased burden on the IT team with increased management complexity.

- No consistency groups, each VM is protected individually.

Appliance-based Replication: More Moving Parts

Appliance-based replication solutions – such as EMC RecoverPoint – are similar to array-based solutions in that they are hardware-based and specific to a single platform. The main difference is that the replication code runs on an external, physical appliance instead of inside the storage arrays themselves. This gives it an advantage over array-based solutions in that it is more flexible and does not consume array resources.

" We have a large, ever-evolving IT environment and it's crucial that all of our capabilities are easy to use and manage, Zerto Virtual Replication lets us accomplish what we need to in DR. It's easy to use, requires very little maintenance and it frees up our team to tackle projects that support our mission to improve healthcare. It's like magic"

— Bob Lanning, Senior Systems Engineer, Premier, Inc.
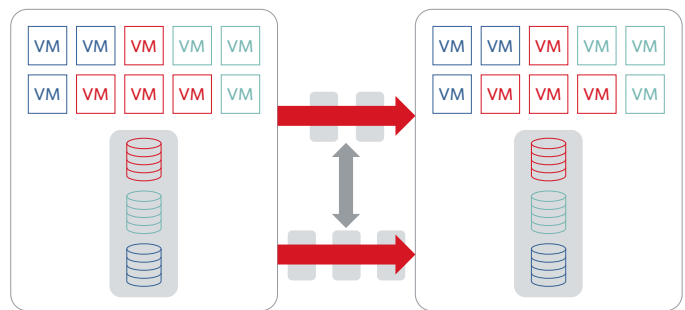
Coordinating two replication products increases management complexity. Array-based replication undermines the investment made in virtualization.

When it comes to protecting virtual environments, however, appliance-based solutions suffer from the same disadvantages as the array-based products. Specifically:

- It is designed to replicate physical entities rather than virtual entities. It doesn't "see" the virtual machines and is oblivious to configuration changes – and due to their dynamic nature, virtual environments have a high rate of change. As a result, BC/DR plans will be out of synch with the current production environment.

- They replicate physical entities rather than virtual entities. Their focus, therefore, is the logical unit rather than the virtual machine. This lack of granularity conflicts with the requirements and promise of virtualization.

- They require dual points of management: the physical management console and the virtualization management console.

- Entire LUN is replicated, whether it is 40% of 90% utilized – increasing power, cooling and storage costs

- Included here is VMware vCenter Site Recovery Manager. This orchestration piece provides limited automation in terms of failover and failback, but

it requires constant coordination and is another component that greatly increases management complexity.

" We really like the simplicity of having full automation and orchestration, combined with robust replication in just one product. I had two separate products – VMware SRM and RecoverPoint – which was challenging to manage. For example, when a new version of vSphere was released it had a feature I wanted to leverage. In order to use it, and ensure BC/DR would not be affected, I had to upgrade not only vSphere, but also SRM, RecoverPoint and the array; it was just too much. Zerto (Virtual Replication) is not only easier to manage, but it handles VSS checkpoints seamlessly and the ability to easily rollback a failover streamlines our BC/DR processes."

— Zach Dickinson, Senior Network Administrator, Rapidparts, Inc

Hypervisor-based Replication

We have seen how three different categories of replication technologies designed for physical IT environments have critical limitations in a virtual context. They undermine the investment made in virtualization and limit its functionality. To fully benefit from virtualization without compromising on BC/DR, a new approach is required.

Before virtualization, replication was managed at the storage layer, which made perfect sense because that's where the information was. If there is a physical box you want to keep track of, you could track it with physical sensors. But in a virtual environment, the boxes aren't (or aren't all) physical, so putting a physical sensor on a virtual box isn't going to help you protect its contents.

The problem is actually common in historical terms: one technology often advances at a faster rate than others, creating a capability gap. Virtualization offers extraordinary capabilities and benefits, but they cannot be fully enjoyed unless and until other technologies within the data center evolve to enable them. Managing a virtual or hybrid environment from the physical storage layer makes it harder to fully realize the benefits of virtualization and inhibits the move to the cloud.

That's why Zerto realized the need to move replication up the stack – above the resources abstraction layer – into the virtualization/hypervisor layer. And that's how hypervisor-based replication was born.

Zerto Architecture: Simple, Effective, and Virtual-ready

Zerto has introduced a virtual-aware, software-only, tier one, enterprise-class replication solution purpose-built for virtual environments. The company's innovative hypervisor-based replication solution is currently the first and only solution that delivers enterprise-class, virtual replication and BC/DR capabilities for the data center and the cloud.

At the heart of this patent-pending replication technology are components that are simply deployed:

- **Zerto Virtual Manager (ZVM)** – The ZVM plugs directly into the virtual management console (such as VMware's vCenter), enabling visibility into the entire infrastructure. The ZVM is the nerve center of the solution, managing replication for the entire vSphere domain, keeping track of applications and information in motion in real time.

- **Virtual Replication Appliance (VRA)** – The VRA is a software module that is automatically deployed on the physical hosts. The VRA continuously replicates data from user-selected virtual machines, compressing and sending that data to the remote site over WAN links.

- **Virtual Backup Appliance (VBA)** – The VBA is software that manages the extended duration recovery points. Recovery of multiple VMs that make up an application can be restored to a consistent point in time at the recovery site. Backups can be archived indefinitely to anywhere, including public clouds.

Because it is installed directly inside the virtual infrastructure (as opposed to on individual machines), the VRA is able to tap into a virtual machine's IO stream. Therefore, each time the virtual machine writes to its virtual disks, the write command is captured, cloned, and sent to the recovery site. This is more efficient, accurate, and responsive than prior methods.

Unlike some replication technologies that primarily offer data protection along with cumbersome snapshots and backup paradigms, Zerto's solution provides continuous replication with zero impact on application performance.

Hypervisor-based replication is fully agnostic to storage source and destination, natively supporting all storage platforms and the full breadth of capabilities made possible by virtualization, including high availability, clustering, and the ability to locate and replicate volumes in motion.
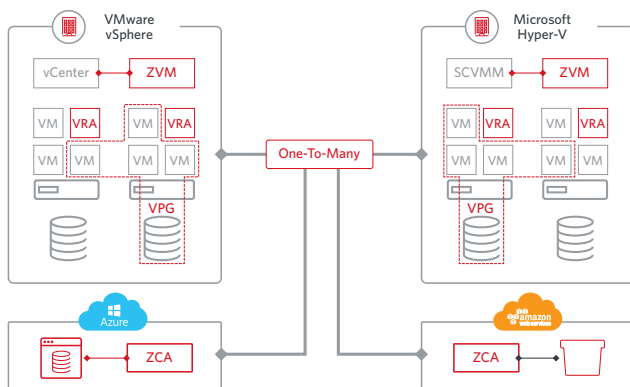
Hypervisor-based replication aligns the production and BC/DR strategy, extending all the benefits and flexibility of virtualization to the data protection and data mobility strategies.

Finally, it installs seamlessly into the existing infrastructure. The carefully architected application configuration does not need to be changed in anyway. Zerto Virtual Replications enables IT administrators to continue to architect for performance and to meet SLAs rather than BC/DR.

Application-centric Protection: An(other) Important Differentiator

Enterprise applications often consist of more than one server. These servers are interdependent so when they are in need of recovery, they must be recovered from a single consistent point-in-time image. Before Zerto, this has been impossible to achieve.
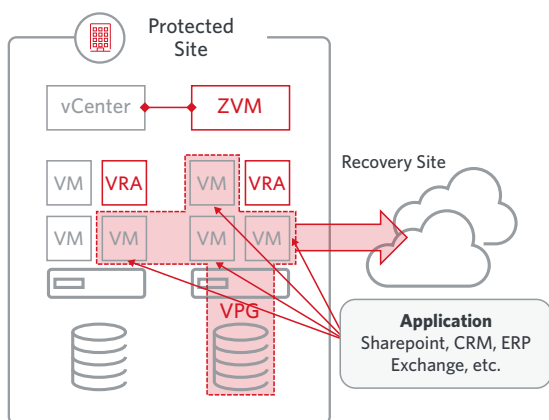
The Virtual Protection Group is a group of virtual machines (VMs) that comprise an application. Zerto Virtual Replication recognizes and preserves these relationships even as the VMs are moved throughout the environment with VMware DRS, vMotion, etc.

Leveraging the concept of storage-based consistency groups that operate strictly at the storage array's logical unit level, and the unique capabilities of the virtual platform, Zerto has developed an important innovation:

Virtual Protection Groups (VPGs), a user-assigned group of virtual machines and their related virtual disks that have dependencies and must be recovered from a consistent image.

Zerto VPGs ensure that enterprise applications are replicated and recovered with consistency, regardless of the underlying infrastructure. This enables organizations to deploy the application across different physical devices to maximize performance, capacity, and/or to reduce the complexity of the infrastructure. The ZVM recognizes VPGs and the component relationships within each one, assuring complete, accurate, and timely replication. While the core idea is readily achievable at the physical storage level, only Zerto has figured out how to do this at the virtual level for both server and storage locations.

" When I first heard about Zerto (Virtual Replication) I was skeptical. Now that we have it deployed, I call it a miracle for BC/DR. We have very aggressive service levels to meet – we must have our mission critical applications up in 15 minutes. With Zerto, we are able to recover our Microsoft SQL Server database, Exchange, File servers and other applications well within our SLA."

— Uzah Chinedu, Infrastructure Manager, Leadway Pensure PFA Limited

Zerto Offsite Backup

Introduced in Zerto Virtual Replication 3.5, Zerto Offsite Backup leverages the data at the replication site for a backup. This removes the overhead and management burden of the backup processes and infrastructure from the production site. With Backup and BC/DR operations in the same user interface it is easier to identify gaps in the data protection strategy while simplifying the management of data protection operations.

HYPERVISOR-BASED REPLICATION BENEFITS

Granularity

The ability to replicate at the correct level of any virtual entity, be it a single virtual machine, a group of virtual machines, or a virtual application (such as VMware vApp), is critical. Zerto's solution can replicate all virtual machines consistently and all of the meta data as well – including vApp meta data. This ensures that the entire application infrastructure can be recovered in the event of a disaster.

A typical enterprise application includes a web server, application server, database server, etc., and all have their
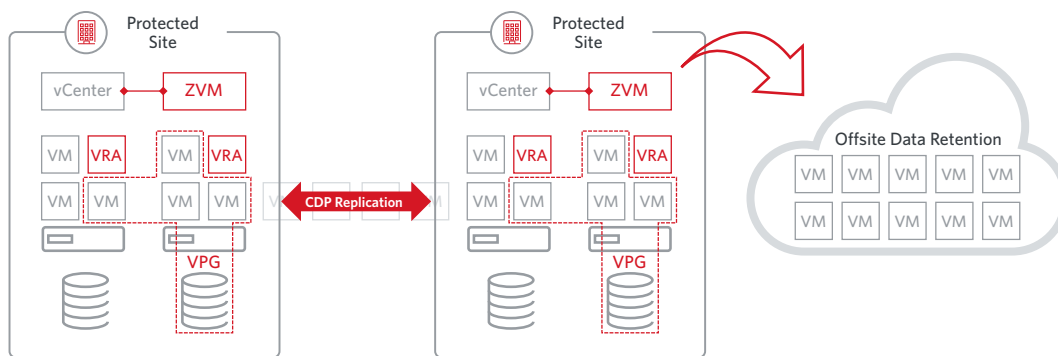
Increase the usefulness of replicated data by leveraging it for backups.

respective disks. Today, administrators tend to put all those disks in a single logical unit in storage so they can replicate the entire application at once without having to search for its individual components. The problem is that this means the entire logical unit must be replicated, even though it may contain other applications that are not in need of replication. That lack of granularity – where administrators cannot identify specific applications and application components to replicate – is inefficient.

For example, a given CRM application may span across eight virtual machines deployed on four physical servers, using five different data stores located on three different logical units. With hypervisor-based replication – and only with hypervisor-based replication – centralized management through the hypervisor layer enables the solution to find what it's looking for no matter where it is.

That is simply impossible with prior, non-virtual- ready replication technologies. The goal is full consistency between and among all application components. With hypervisor-based replication, that goal is achieved.

" We believe that the virtual machine is the new atomic unit for replication strategies. Zerto works at the virtualization level, which allows us greater flexibility in the type of storage we replicate to and removes the limitations around LUN-based consistency groups. This solution adds a deeper level of control of recovery time objective (RTO) and recovery point objective (RPO) in a virtual environment than traditional replication methods."
— R. Todd Thomas, Chief Information Officer, ARA

Scalability

There are two aspects of scalability: deployment and management. As a virtual infrastructure grows, an organization's DR capabilities must grow with it seamlessly, without having to purchase, install, and

configure additional proprietary hardware. Zerto's hypervisor-based replication solution is software-based so it can be deployed and managed easily, no matter how fast the infrastructure expands. The solution also enables administrators to perform operations and configure policies at the level of the virtual machines or applications.

Ease of Management

With no guest-host requirements or additional hardware footprint, Zerto's solution is easy to manage. It simply resides in the hypervisor, enabling centralized management from the virtual management console (such as VMware vCenter). Organizations can now manage everything from the same console. Because it is software-based, it is user-installable (the VRA install process itself is automated), user-configurable, and scalable.

" Our customers are running their businesses 24 hours a day, 7 days a week and they require short outage windows for migrations to minimize disruptions. With Zerto Virtual Replication, we are able to cut over applications in just 15 minutes. The setup is very simple and does not require customers to change anything in their environments. Within minutes we are replicating the applications to the new location with no disruption to the environment. We will be using Zerto Virtual Replication for our next migration project."
— TJ Tran, Platform Architect, Fujitsu

Server and Storage Motion

One of the great advantages of the virtual environment is the ability to quickly move virtual machines around from one physical server or array logical unit (data store) to another. This might be done for load balancing or other strategic data management reasons. With VMware, this is accomplished manually through vMotion or automatically using Distributed Resource Scheduler

(DRS). Only hypervisor-based replication supports this capability, continuing to locate and replicate data no matter where it resides or where it is moved.

Hardware-agnostic

Hypervisor-based replication is hardware-agnostic, supporting all storage arrays, so organizations can replicate from anything to anything. In today's increasingly heterogeneous IT environment, this allows users to mix storage technologies such as Storage Area Network (SAN) and Network-Attached Storage (NAS), and virtual disk types such as Raw Device Mapping (RDM) and VMware File System (VMFS).

" The flexibility and usability of the Zerto solution was the deciding factor in our decision. Because the technology is hardware and storage agnostic, it provides us superior protection encompassing our entire environment, without the need for vendor-specific solutions. The singular management interface allows us to seamlessly manage our replication groups within the vSphere client, and provides excellent visibility of the replication statistics and process. Setup and configuration was quick and painless, and were completed within only a few hours. Zerto has proven to be indispensable in our environment and we are very pleased with the results we've seen."

— Erik Rasmussen, System Administrator

Remarkably Effective

In Business Continuity/Disaster Recovery, the two key metrics are Recovery Point Objective (RPO) and Recovery Time Objective (RTO). The former is an indication of the amount of data at risk of being lost between data protection events and how long until all the data at risk is recovered. The latter refers to the amount of time it takes to recover from a data loss event and return to normal operation and availability. Zerto's hypervisor-based replication solution achieves RPO in seconds and RTO in minutes.

" We virtualized our environment to better leverage assets within our data centers, and we were making great progress, until it came to the BC/DR strategy. A traditional, physical solution was not meeting our needs. ZVR not only met our requirements, it far exceeded our expectations in terms of service levels. We see RPOs of seconds and RTOs of minutes."

— James Horrod, Group Platform Architect, KingFisher

CONCLUSION

If you have a virtual or hybrid environment, you cannot realize the full benefits and promise of virtualization unless your replication solution is virtual-aware and virtual-ready. Zerto's hypervisor-based replication technology is the first and only solution that delivers tier one, enterprise-class, virtual replication and BC/DR capabilities for the data center and the cloud.

Your information will only grow over time; replication demands will also grow, as will the scope of your virtualization initiatives. Purpose-built for the virtual environment, hypervisor-based replication will position you for growth and optimize your business continuity and disaster recovery activities.

THE EVOLUTION OF ZERTO VIRTUAL REPLICATION

Since Zerto Virtual Replication 1.0 was released in August 2011, numerous critical features have been added to improve BC/DR for virtual environments. Learn more about these features through our other whitepapers and reference architectures:

Zerto Virtual Replication 2.0 - Multi-tenant and multi-site replication – Many organizations have more than one site, Zerto Virtual Replication 2.0 enabled replication from many sites to one shared infrastructure increasing operational efficiencies and decreasing capital costs.

Zerto Virtual Replication 3.0 – In Zerto Virtual Replication 3,0, the Zerto Cloud Manager and the Zerto Self-Service Portal were introduced building on the core tenant of simplicity. The Zerto Cloud Manager enables complete management of all functions from one simple interface across several sites. Built for Cloud Service Providers and enterprises with more than 2 sites to manage, the Zerto Cloud Manager manages a mix of cloud-based resources and customer on-premises resources and supports both vCenter and vCloud sites in a single control panel.

Zerto Virtual Replication 3.5 – This version of Zerto Virtual Replication introduced Zerto Offsite Backup which increases the usefulness of the data at the replication site by leveraging for backups. Backup agents, appliances and other tools can be eliminated from the production environment, reducing the impact on production workloads.

Zerto Virtual Replication 4.0 future proofs the IT strategy for all data centers whether private, public, or a hybrid cloud mix of infrastructure by not being tied to a hypervisor or storage vendor for BC/DR and workload mobility. It is the first software solution to protect, replicate, and migrate data between VMware vSphere and Microsoft Hyper-V hypervisors, as well as across private, hybrid and public cloud environments including Amazon Web Services (AWS). Moving and protecting workloads across clouds or hypervisors is now simple

for IT managers, while still providing robust protection including low recovery times, simplicity of operation and scalability.

ZVR 4.0 forms the backbone for Zerto's Cloud Continuity Initiative, enabling seamless migration of workloads so enterprises can leverage any on-premises or cloud environment.

IDC Technology Spotlight: Zerto Cloud Continuity Platform

Zerto Virtual Replication 4.5 introduces the new Journal File Level Recovery™ feature which enables the restoration of any file from a point in time just seconds before a deletion, virus, or data corruption occurred to significantly reduce the impact of data loss on common daily requests for data restoration. This powerful new feature gives business and IT leaders' greater confidence in data restoration including SAP, SQL, Oracle and Exchange database files and user data in home folders and file shares. This enables point-in-time recovery with the ability to rewind data back in time to recover from corruptions, deletions or even system-wide data disruptions due to ransomware or system upgrade errors.

Datasheet: ZVR 4.5 - What's New

Zerto Virtual Replication 5.0 enables organizations to evolve beyond disaster recovery and embrace IT Resilience. Take the first step to a hybrid cloud strategy by leveraging Microsoft Azure for disaster recovery. With One-to-Many replication, simultaneously replicate on-premises for lightning fast restores direct to production, to a secondary site or managed cloud for DR and to Azure or AWS for longer-term retention. The journal has been extended to enable point-in-time recovery for up to 30 days and with the new Zerto Mobile App, monitoring the protected infrastructure can be done at anytime from anywhere, via any Android or iOS device.

Datasheet: Datasheet: ZVR 5.0 – What's New