

# DISASTER | 101 RECOVERY



WHY YOU NEED DR  
eBOOK

# 1 | WHY YOU NEED DISASTER RECOVERY









# 2 | MEASURING DOWNTIME











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## COMPARING DIFFERENT REPLICATION TECHNOLOGIES

# COMPARING DIFFERENT REPLICATION TECHNOLOGIES

## Array-Based Replication

Sometimes called storage-based replication, these solutions are deployed as modules inside the storage array and replicate the entire LUN, regardless of its utilized capacity. They are designed for physical rather than virtual infrastructures and, as such, eliminate the benefits of virtualization.

## Agent-Based Replication

Otherwise known as Guest-, or OS-based replication, these are software components that must be installed on each physical and virtual server. Although more portable than array-based solutions, the requirement to install modules on every server limits scalability.

## Hypervisor-Based Replication

As solutions designed to enable the full benefits of virtualization, these deploy a software module directly inside the virtual infrastructure. All writes are captured, cloned and sent to the recovery site at the hypervisor layer, making it more efficient, accurate and responsive than prior methods.

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# REPLICATION TECHNOLOGIES

## Synchronous Replication

Ensures all data is written in the source and target storage simultaneously, waiting for acknowledgment from both arrays before completing the operation. This relies on matching storage arrays and fiber channel latencies to minimize performance impact.

## Asynchronous Replication

Uses snapshots to take a point-in-time copy of the data that has changed and sends it to the recovery site. The frequency is typically set on a schedule of hours, depending on the number and frequency of snapshots that the storage and application can withstand.

## Near-Synchronous Replication

Near-Synchronous Replication is constantly replicating only the changed data to the recovery site within seconds— it's always on. It does not need to be scheduled, does not use snapshots and writes to the source storage without having to wait for acknowledgment from the target storage.

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	Synchronous	Asynchronous	Near Synchronous
<b>Networking</b>			
Replicate over any distance, avoiding regional disasters	-	✓	✓
Compressible replication traffic	-	✓	✓
Utilize cheaper IP links including VPNs	-	✓	✓
<b>Data Loss &amp; Recovery</b>			
*Data loss (disk & in-memory data)	-	-	-
*Data loss on disk writes	✓	-	-
Seconds of data loss on disk writes	-	-	✓
Seconds of data loss of all data (disk & in-memory)*	-	-	✓
Data corruptions immediately written to target	✓	-	-
Point-in-time recovery to increments in seconds	-	-	✓
<b>Performance &amp; Snapshots</b>			
Always-on protection with no scheduling overheads	✓	-	✓
No site link performance overhead on writes	-	✓	✓
Snapshots for point-in-time recovery	✓	✓	-
No performance impact of snapshots	-	-	✓
No storage overhead for snapshots	-	-	✓
Application consistency without snapshots	-	-	✓
Point-in-time recovery to increments in seconds	-	-	✓

# WHICH TYPE OF REPLICATION IS RIGHT FOR YOU?

## Synchronous, Asynchronous, or Near-Synchronous

Each data replication technology has different attributes, and depending on the requirements of your workloads and SLAs, you can use the replication method that best meets your requirements.

\*Subject to the frequency on which the application can quiesce writes to disk without the overhead of utilizing snapshots.

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HOW DO REPLICATION  
TECHNOLOGIES  
STACK UP?

# SNAPSHOTS

*"The main problem with snapshots is not only the potential for performance impact, it is the lack of granularity of the points-in-time for recovery they offer."*

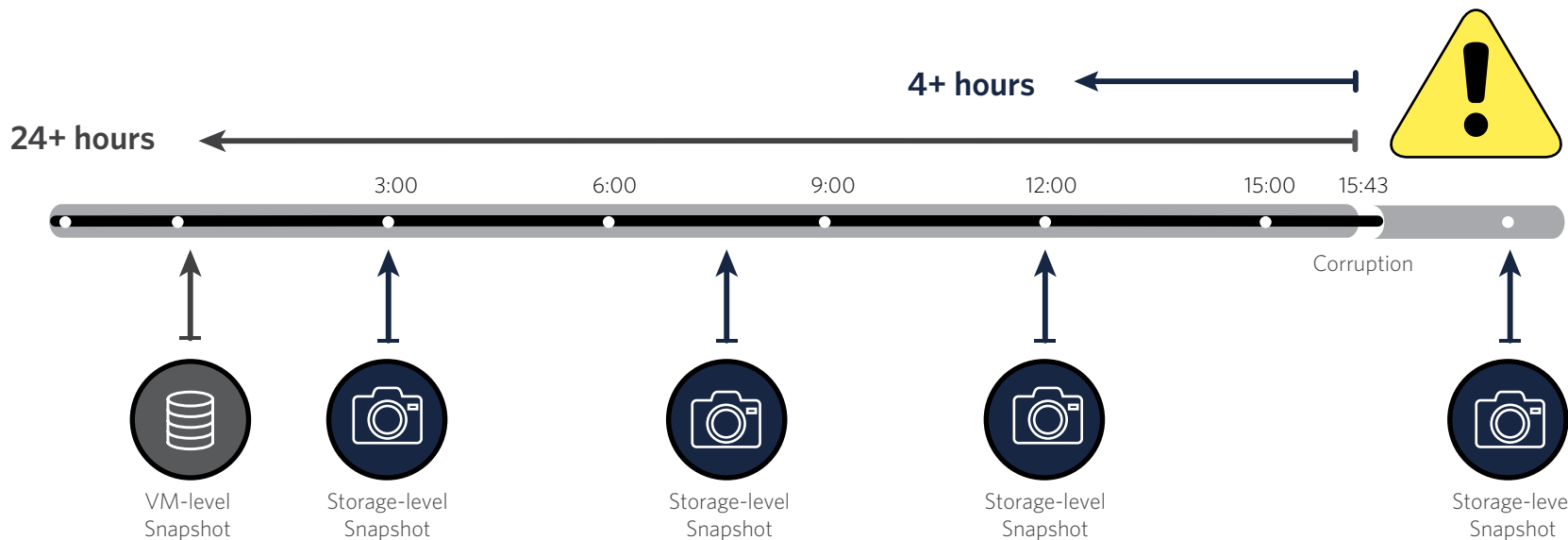
Virtualization Evangelist

## VM-level Snapshots

VM-level snapshots are created in the hypervisor and incur the biggest performance impact. It is not recommended to create, remove or leave VM-level snapshots running on production VMs during working hours.

## Storage-level Snapshots

Storage-level snapshots incur less performance impact than VM-level snapshots, but still require processing power in a storage controller, and at scale can still start to degrade performance. The potential for performance impact very much limits the frequency at which storage-level snapshots can be created.



If we take the above example of a data corruption at 15:43, then a VM-level 24-hour snapshot-based replication solution means you are going to potentially have nearly 16 hours of data loss, as you would have to restore a replicated snapshot from last night. The same example with storage-level snapshots would result in data loss of nearly 4 hours.

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# CONTINUOUS DATA PROTECTION (CDP)

*"CDP will ensure our information is safe from any natural disasters or hacking incidents."*

Bonyang Goo | Deputy Director IT Development Department | Seoul Daily News

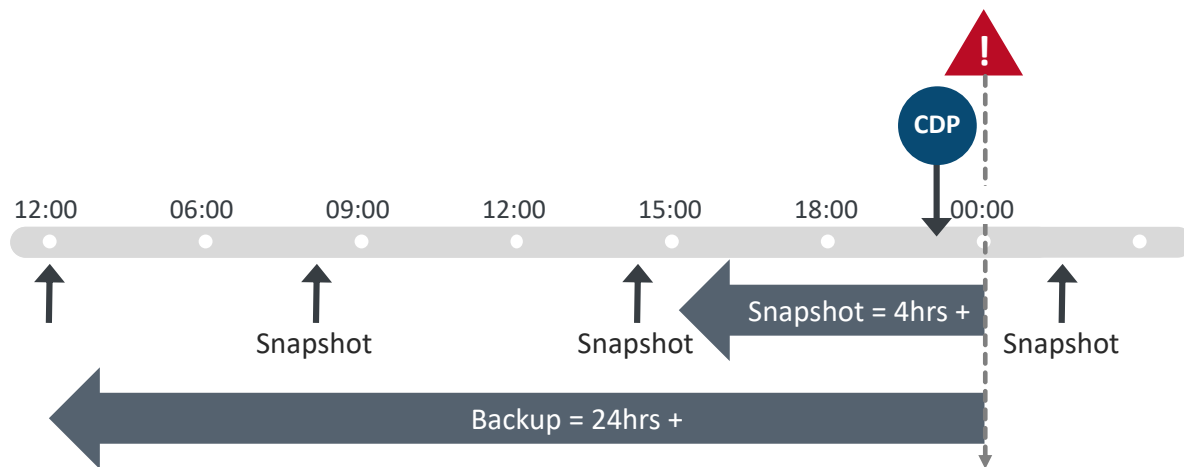
## Continuous Data Protection (CDP)

Continuous Data Protection (CDP) utilizes change-block tracking at the hypervisor layer to constantly replicate data as it is written to storage. Because CDP replicates only changed information, rather than an image of the entire host or array, there is no impact to the performance of the replicated VM.

Hypervisor-based CDP also utilizes journal technology to keep a log of all the changes occurring in a specified journal time frame, allowing point-in-time recovery in increments of just seconds for the length of the journal.

Because CDP is always on and always replicating the most recently changed data, it offers considerably lower RPOs than snapshot-based solutions. This results in significantly less data loss to the business and consequently, a far lower cost of impact.

Additionally, utilizing journal technology rather than VM-level snapshots for point-in-time recovery delivers multiple benefits beyond simply the sheer number of checkpoints available.



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# SNAPSHOTS

VS

# CDP

Storing multiple snapshots on replica VMs incurs a significant VM performance penalty if you attempt to power on the replica VM.



With journal-based protection, the journal is only used until you commit to the point-in-time selected, without the performance impact of many snapshots.

Using snapshots on replicated VMs allows no way of controlling the total space used for snapshots, or the ability to store the data change on a separate datastore. This makes it unscalable in terms of being able to set SLAs and define maximum limits on the data space used by the snapshots.



With journal-based protection, you can place the journal on any datastore and place maximum size limits and warnings; so as not to fill the datastore, which could otherwise break replication and recovery.

With snapshot-based replication, there is often significant overhead on the storage arrays for replication reserves; which can be 20-30% on both source and target storage in many cases.



With journaling technology, no extra space is used in the source storage as no snapshots are created. Only 7-10% of the target storage is typically used for the changed data, freeing up significant amounts of disk space.

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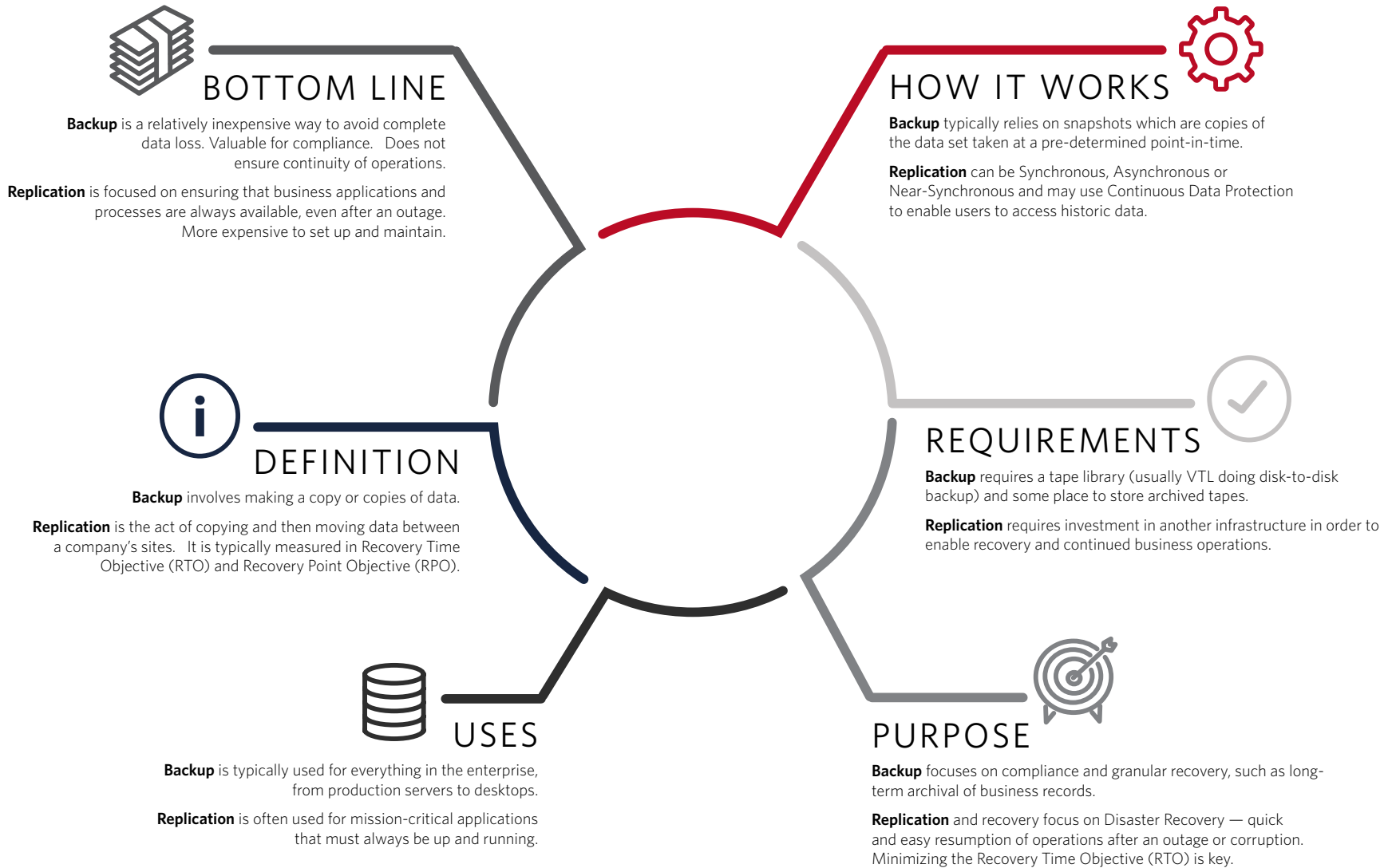
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# COMPARING BACKUP & REPLICATION



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# 5 REASONS

## WHY BACKUP IS NOT DISASTER RECOVERY

<b>1</b>	<b>Service Levels</b>	Backups typically happen once per day and at night, so your RPO could be 23 hours! When protecting mission-critical applications, 23-hour data loss is not acceptable. Without any recovery orchestration, the RTO will also be significantly higher. Rebuilding a virtual machine and everything that goes with it, from tape, can take days; from disk, it might be slightly faster — a few hours.
<b>2</b>	<b>Application Impact</b>	Backups occur at night because making a copy of an application and its data drains the CPU on the server. If you need more aggressive RPOs than 23 hours as stated above, that means you have to create copies more frequently. This is possible, but at the expense of CPU. This significantly impacts end-user productivity.
<b>3</b>	<b>Automated Recovery</b>	Building an environment from a backup, especially a tape backup, is extremely time consuming. This is why the RTOs are so long. With an enterprise-class disaster recovery solution, the entire recovery process can be automated. For mission-critical applications, this entire process should take just a few minutes. This is a very different service level from a backup solution. Additionally, an automated process is a foolproof process, since every manual step that is introduced is an opportunity for an error.
<b>4</b>	<b>Retention</b>	Backups are typically stored for a very long time for compliance and audit purposes. Disaster recovery information is stored for hours or days. Additionally, for a backup, you will have just one snapshot of the application and data. For an enterprise-class disaster recovery solution, you will have several points in time to failover to, just in case the last point-in-time is corrupted.
<b>5</b>	<b>Reverse Replication</b>	In the event of an outage, once an application has been made available on a target site, you must extend that application's protection to include new data being created. However, you must make sure that this application continues to be protected as the users create additional data. A backup solution will not start taking backups and ship them back to the production site. A disaster recovery solution will ensure the application is still protected by replicating back to the source site.

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# 5

## WHY RECOVERY AUTOMATION & ORCHESTRATION IS IMPORTANT

MANUAL RECOVERY, SCRIPTED RECOVERY,  
AUTOMATION & ORCHESTRATION SOFTWARE



## Manual & Scripted Recovery

Many organizations choose manual or scripted recoveries due to the cost and complexity of buying and installing a solution just to handle the recovery and testing operations. Testing frequency is also impacted as downtime is required to conduct the tests, which in combination with staffing overheads introduces a significant risk of the business not being able to recover from an outage.

This means that most synchronous replication based environments have RTOs measured in hours to days, as the recovery needs to be performed manually or by using untested scripts. The extended disruption to business operations caused by the long recovery process can have a significant financial impact.

Some synchronous replication solutions are used as part of a metro-cluster, High Availability (HA) solution. In this configuration, all the VMs are randomly restarted in the secondary datacenter by a HA service in the event of power loss. This scenario results in a potential RTO of many hours, as the VMs are not recovered consistently or in the correct order, requiring manual reconfiguration by multiple administrators in order to restore operations.



## Automation & Orchestration Software

Hypervisor-based replication includes replication, recovery automation and orchestration all-in-one solution. The VMs that form each application are recovered together in consistency groups from the same point-in-time. Boot-ordering is then applied to ensure that the VMs come online in the correct order, and re-IP or MAC addressing can be utilized if needed to ensure there is no break in communication. This ensures an RTO of just minutes with no manual operations required as the application is automatically recovered in a working and consistent state.

No-impact failover testing also enables this automated process to be tested during working hours in minutes, with no shutdown in production or break in replication. Reports can be generated to show the testing outcomes and prove the recovery capability. This enables organizations to increase the frequency of DR testing, mitigate risk, and satisfy compliance initiatives.

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# TOTAL COST OF OWNERSHIP CONSIDERATIONS (TCO)

TCO OF TRADITIONAL  
ARRAY-BASED REPLICATION VS.  
HYPERVISOR-BASED REPLICATION

# MAIN CONSIDERATIONS TO REDUCE YOUR TCO

## Snapshot Space Utilization & Cost

**Challenge:** Snapshot solutions typically consume more than 20% of both the source and target storage, plus an additional 5% of replication reserve space. The cost and overheads of utilizing array-based replication must therefore include the cost per GB/TB multiplied by the storage usage of the snapshots and replication reservations.

**Solution:** The ability to recover to previous points in time is enabled by keeping a journal on the recovery site storage, which dynamically grows and shrinks to the size of the changes in time it is configured to keep.

## Recovery Orchestration & Automation

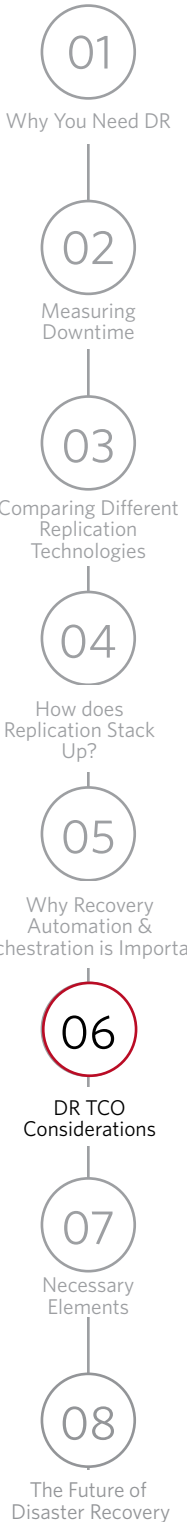
**Challenge:** Utilizing storage replication simply creates a copy of the data in the recovery site. To recover the data during testing or a DR event, it needs to either be done manually using scripts, or by utilizing an orchestration and automation solution. Due to the time it takes to recover manually and the difficulty in conducting tests, an additional orchestration and automation solution is recommended. The cost of purchasing the licensing of the additional solution and managing multiple solutions should therefore be factored in.

**Solution:** Hypervisor-based solutions include recovery automation and orchestration features such as application-consistent VM boot-ordering, re-IP/MAC addressing and custom pre-/post-scripting, in addition to the continuous replication technology. This significantly reduces the RTO as well as the cost and complexity of managing multiple solutions.

## Storage Lock-In

**Challenge:** Array-based replication solutions are vendor-specific and require matching storage arrays in both the source and target sites. This can significantly increase the TCO of the next storage refresh by having to buy new and matching storage arrays, just to configure replication. There is no ability to mix storage vendors and technologies to get the best price-to-performance ratio in a recovery site, or to introduce new storage vendors to improve performance.

**Solution:** Hypervisor-based replication operates at the virtual, not physical layer, meaning it is inherently storage-agnostic. This allows you to buy or use any storage in any site, reducing the TCO of your next storage refresh and enabling the seamless adoption of new technology. Even if the same storage is used in both source and target sites, replicating from the hypervisor removes complexity to save on the cost of management overheads.



# 7

## NECESSARY ELEMENTS FOR A SUCCESSFUL DISASTER RECOVERY PLAN

Your disaster recovery plan consists of more than just how you are going to recover your systems and applications. When a disaster happens, there is a lot involved before recovery is initiated.



# 7 ELEMENTS



## 1. COMMUNICATION

Ensure lines of communication between employees remain open during a disaster. Services you normally rely on might be limited or unavailable. Don't depend on email or cell phones. Make sure landline numbers are accessible and even think about two-way radios. Consider arranging a certain location where people can meet, if all else fails.



## 2. CONTACTS (ROLES & RESPONSIBILITIES)

Who does what? The roles and responsibilities of everyone involved in the DR plan should be clearly laid out. Individuals should be aware of their specific duties and everyone needs to know whom to contact to get the ball rolling. Ideally, you should have a backup assigned for each role, but certainly for those key decision makers.



## 3. LOGINS

Hopefully, the only person with access to initiate your recovery process is not on holiday, trekking in the mountains without a phone signal. Restricting access to only the people who need it is certainly a good idea, but make sure there is more than one person who can access the systems necessary to perform the recovery.



## 4. REMOTE ACCESS TO INITIATE RECOVERY

We are rarely tied to a single location during our daily routines, so the ability to monitor and manage operations remotely becomes of great benefit. In a disaster situation, however, you may not have access to your primary facility at all. Ensuring that you are able to initiate your disaster recovery plan from another remote location is vital.



## 5. DOCUMENT EVERYTHING

Absolutely every essential activity that makes up your disaster recovery procedure should be written up with clear instructions and directions. This includes the areas already discussed but should also include step-by-step guides for people to follow. Having processes clearly described can help maintain calm and control.



## 6. TEST YOUR PLAN, THEN TEST IT AGAIN!

Testing the failover capabilities of your disaster recovery solution is of crucial importance to make sure it works when needed. But it is just as important to test the rest of your plan and make sure it is equally as robust. Test at least once a year - preferably more - and make sure the team is as familiar as they can be with their duties.



## 7. UPDATE YOUR PLAN

A final, small and maybe obvious point, but a very important one: Make sure your plan is up-to-date. If it's 5 years old, you are asking for trouble. Please... update, update, update!

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| THE FUTURE OF  
DISASTER RECOVERY

# DISASTER-RECOVERY-AS-A-SERVICE

(DRaaS)

Since a dedicated DR site can be expensive to maintain and scale, many organizations are looking to outsource the costs. Replacing the costs of a secondary site (hardware, software, power, cooling, maintenance, etc.) with a predictable monthly expense is a very attractive option. DRaaS has become increasingly popular as a way for organizations to reduce the time, resources, and costs of hosting and managing their own DR solution.

## DRAAS OPTIONS

1

### Managed Service

A fully managed service, where all of the secondary site infrastructure is provided at a rental cost and the tasks of managing and invoking the replication and recovery process are controlled by the service provider. For organizations that are not familiar or confident with implementing or managing a DR solution — or simply don't have the resources to do so— this can be a very useful option.

2

### DIY Service

Alternatively, a hosted DIY service may be selected, in which case the secondary site infrastructure will be provided as before, but the process of managing the disaster recovery solution will be controlled by the customer. For those happy with taking on this responsibility, a DIY service can be a cheaper option than a managed one.

!

## IMPORTANT TO REMEMBER

The type of disaster recovery solution used to protect your data will be dependent on the service offered by the provider. Ensure you know what solution you will be getting in order to fully evaluate the service and potential benefits.

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# WHY CONSIDER DRaaS?

DRaaS providers do this every day, so they are knowledgeable about getting environments online quickly and can help you avoid common mistakes. They also serve as additional resources that are focused on your datacenter recovery when you need it most.



## Control Costs

Gain greater predictability of storage costs and choose the DR strategy that is right for you.



## Diversify Data Protection

Gain confidence with target site diversification. Take advantage of the extended global network of DR sites afforded by managed service providers.



## Take DR to the Cloud

Leverage a DRaaS provider to be your guide to the cloud.

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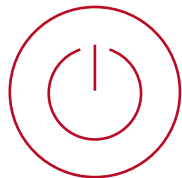
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# MULTI-CLOUD/ HYBRID CLOUD

Multi-Cloud, Hybrid Cloud is rapidly becoming the preferred model for IT as it enables businesses to optimize their IT environment and gives them limitless choices. With a cloud based solution, all elements of disaster recovery can be structured based on target costs and SLA.

**Disaster recovery, with its unpredictable bursting nature, is one of the best-suited processes to have in the cloud.**



**Performance &  
Capacity  
On-Demand**



**Pay-for-what-  
you-use**



**Remove  
Second Site**

Having the right replication & recovery solution in place can overcome all these barriers, as it should not only serve as a protection solution, but also as a mobility solution. With the right solution, enabling disaster recovery in the cloud now can provide a stepping-stone to the future adoption of other, more critical services, as organizations grow more confident in the use and performance of the cloud.

**Legacy DR solutions can however create many barriers to adopting a Multi-Cloud, hybrid cloud strategy:**



Different hypervisors and APIs create infrastructure silos, making it very difficult to leverage different clouds for the same workloads.



Applications cannot be easily replicated, managed, or used between disparate environments.



The initial reconfiguration and downtime costs associated with “bursting” into an environment, or replicating to a different silo are simply too high.

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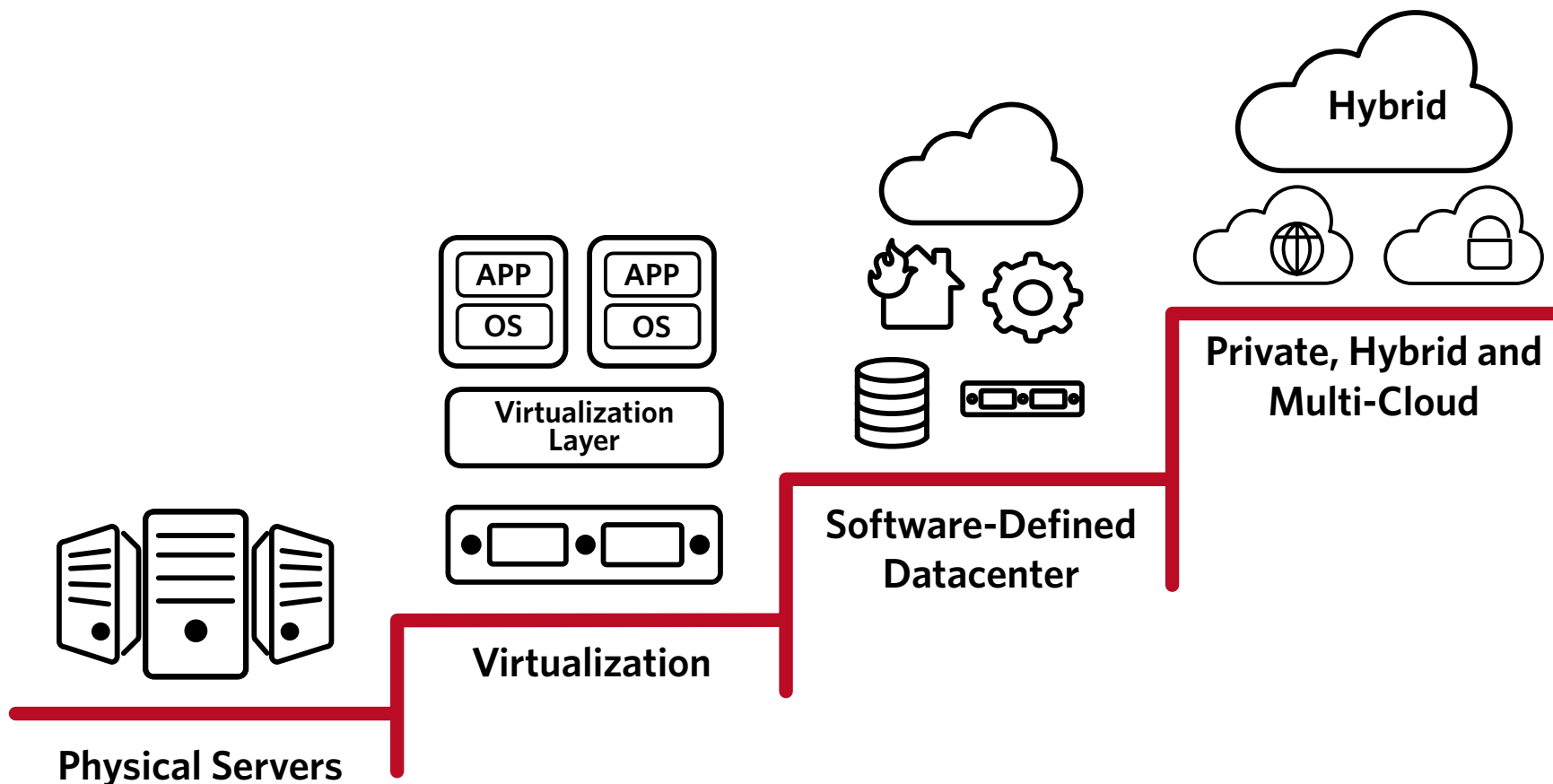
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# THE EVOLVING IT LANDSCAPE

The landscape of modern technology is changing at a rapid pace, an example of this are the demonstrable changes in server technologies in recent history; evolving from physical hardware to cloud and beyond. The term IT Resilience is a relatively new concept; born from the need for companies to proactively respond to both planned and unplanned downtime. IT has evolved substantially, from the creation and evolution of virtualization, the software-defined datacenter and now the hybrid cloud. The need to maintain a robust infrastructure that remains flexible enough to withstand constant transformation has become essential, but continues to pose a difficulty for many organizations.



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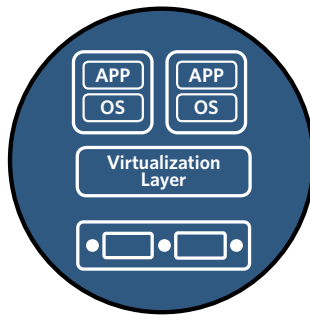
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# DIGITAL TRANSFORMATION

## Digital Transformation

describes the ongoing and everlasting process of upgrading and refreshing an organization's IT infrastructure. Ensuring the business stays up-to-date with modern developments and remains competitive is paramount, but becomes increasingly difficult as technology develops faster.

## EXAMPLES OF TRANSFORMATION PROJECTS



*Adopting a new hypervisor to support virtualization strategies*



*Implementing new software-defined methods of performing tasks previously requiring hardware investment*



*Embracing a private, hybrid, or Multi-Cloud strategy to remove a physical footprint altogether*

Each of these processes will have unique barriers to adoption as you would expect, but by embracing the concept of IT Resilience organizations can significantly reduce, or even completely remove any barriers to success.

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“With IT Resilience, organizations can withstand any disaster, confidently embrace change and focus on business.”

**24/7**  
BUSINESS 

# IT RESILIENCE

**72%**

Of companies have experienced an IT outage in the last year<sup>1</sup>

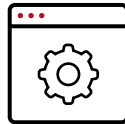
**70%**

Of enterprises that will have a hybrid cloud strategy by 2019<sup>2</sup>

## 3 STEPS TO IT RESILIENCE



Deliver an Always-on Customer Experience



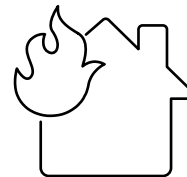
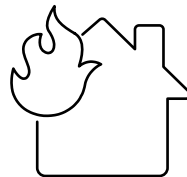
Move With Ease and Without Risk



Leverage Cloud to Accelerate Business

**1 in 3**

firms has had at least one declared disaster or major disruption during the past 5 years



## IT Resilience

IT Resilience has come about as a result of the long-overdue evolution of disaster recovery solutions to bring them in line with today's competitive business landscape. By its very nature, IT Resilience supports and enables the process of digital transformation by removing physical dependencies and enabling workload mobility & complete cloud agility

It also provides truly enterprise-level protection of all applications and data with continuous availability. IT Resilience is necessary to provide organizations with the confidence to grow with IT's changing landscape and simultaneously withstand any potential disruption to the business—be it planned or unplanned.

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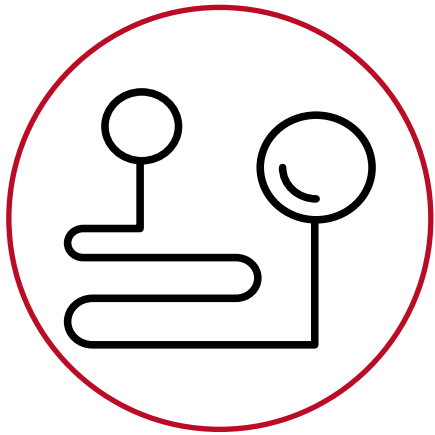
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Sources:

<sup>1</sup> Gartner BCM survey (<https://www.gartner.com/doc/3200321/survey-analysis--bcm-survey>)

<sup>2</sup> Gartner "The future of the Datacenter in the Cloud Era" (<https://www.gartner.com/document/3079122?ref=unauthreader&srcId=1-3478922254>)





# CONCLUSION

## SO, WHERE DO YOU GO FROM HERE?

Zerto helps customers accelerate IT transformation by eliminating the risk and complexity of modernization and cloud adoption. By replacing multiple legacy solutions with a single IT Resilience Platform, Zerto is changing the way disaster recovery, data protection and cloud are managed. With enterprise scale, Zerto's software platform delivers continuous availability for an always-on customer experience while simplifying workload mobility to protect, recover and move applications freely across hybrid and multi-clouds. [www.zerto.com](http://www.zerto.com)

### About Managecast Technologies, Inc.

100% focused on cloud backup and DR as a Service (DRaaS)

Contact us to learn more: [sales@managecast.com](mailto:sales@managecast.com) or call 513-735-6868, Option 2

