EMC 15-MINUTE GUIDE TO CONTINUOUS AVAILABILITY
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A Complete Solution for Continuous Availability

Take The Next Step
OVERVIEW

As the reliance on applications and data to conduct business grows, organizations, users and customers have less and less tolerance for downtime. Everyone expects to be able to access applications and data whenever and wherever they need to. To meet these expectations, organizations have tended to focus on high availability infrastructures that minimize the downtime caused by planned and unplanned outages, reduce its frequency, and shorten recovery point objectives.

But this is no longer enough. The demand is now for IT infrastructures that are continuously available with no downtime at all. Many organizations have taken the first step towards continuous availability by creating highly available clustered applications and server virtualization environments. But these architectures share a weakness: they rely on a single point of access for application data.

Now there’s another way. By implementing a continuously available storage infrastructure with EMC® VPLEX® and continuous data protection with EMC RecoverPoint®, IT organizations can deliver continuous availability and create a trusted IT infrastructure that everyone can depend on.

TODAY’S CHALLENGES

1. **Unplanned Downtime**

   Unplanned disruptions can be caused by natural disasters such as unusual weather events, fire or floods that can bring down components or entire sites in a matter of minutes. Human-caused disasters such as power or communications outages can be just as devastating.
Planned Downtime

Unplanned outages only tell half the story. There are many outages in the day-to-day operations of a data center that are planned as part of ongoing maintenance. Activities such as software and firmware upgrades, data moves for maintenance or load balancing, array replacement, tech refresh or data center relocation can cause as much disruption as unplanned outages—or more.

Cost of Downtime

Downtime is expensive. Although the actual cost depends on the unique characteristics of a given organization, a study by Enterprise Management Associates in 2012 indicates that outages in US data centers cost an average of $45,000 per hour. That's because downtime can lead to:

- Lost transactions—if the ordering system is down, customers can't place orders
- Lost productivity—as users struggle to find workarounds when critical applications are unavailable

Ultimately, downtime can have a major impact on an organization's bottom line.
Continuous availability addresses the challenges of planned and unplanned outages and protects against the financial and productivity losses of downtime by providing:

- Data mobility for non-disruptive relocation of application data before a planned outage would have an impact
- Continuous data protection for operational recovery in the event of data loss or corruption

Transform High Availability

**Traditional High Availability**

Traditional array-based replication solutions, such as host-based mirroring or array replication, protect users against major site issues, but failover and application restarts are manual processes and therefore take time. With traditional array replication, information is only read/write accessible from one instance at a time. So applications and data will be unavailable while the secondary site is starting up. The downtime (measured as the recovery time objective, or RTO) can be painful.

Furthermore, the infrastructure at the secondary passive site is generally unused except for disaster fail-over. It is not unusual for IT departments to use older equipment taken out of service in the data center to build out this passive recovery site, so performance can suffer when running on the backup infrastructure.

And it is not uncommon to hear stories about organizations deciding not to invoke a secondary site failover during an unplanned outage owing to lack of confidence that the secondary site will work properly.
EMC VPLEX for Continuous Availability

An active/active environment, within a single data center or across data centers, significantly reduces downtime, improving the organization’s business continuity strategy and enabling it to sustain operations during a wide range of scenarios that would ordinarily take the services offline.

The VPLEX storage virtualization platform enables the creation of an active/active environment and delivery of continuous availability.

VPLEX sits in-band between hosts and arrays providing a storage abstraction layer. Arrays are treated as a large pool of virtual storage that can be carved up and provisioned as volumes. Volumes can be mirrored and presented to hosts through VPLEX as distributed virtual volumes. These virtual volumes are mirrored on the arrays to protect against a single array failure and provide simultaneous read/write access to the underlying physical storage arrays. In the event of an array failure, the image on the remaining arrays will remain accessible resulting in zero downtime for the data stored on that virtual volume.

Distributed virtual volumes are made available to hosts through a VPLEX cluster, made up of between two and eight VPLEX directors. Each director is built from the ground up with availability in mind, containing dual paths, processors and ports. All VPLEX directors in a cluster share a common coherent cache. As a result, a host can access any volume on any VPLEX director: in fact, volumes can be accessed from multiple directors simultaneously. If any VPLEX director should fail, hosts can continue accessing their volume and application data from any other director. In this way, hosts can continue to access volumes and application data even in the event of a full array failure, resulting in continuous availability for a single site.

This architecture can be extended to multiple sites by distributing the VPLEX clusters. When you distribute a VPLEX cluster to a second site, you also distribute the cache coherency between sites. Volumes are mirrored across sites to create distributed virtual volumes that are simultaneously read/write accessible at both sites. An off the shelf host cluster can then be implemented in a stretched configuration as it is able to leverage the active/active nature of the VPLEX distributed volume. As the host cluster is now stretched, in the event of a full site failure such as a power outage or regional disaster, hosts at the remaining site can automatically continue to access the same distributed virtual volume from the remaining VPLEX engines at the second site.

While host access may be interrupted briefly as the service is restarted, VPLEX is certified to work seamlessly with high availability host clustering technologies such as VMware® High Availability®. In fact, VPLEX supports most major cluster server applications. When application outages occur, these technologies can rapidly restart clustered hosts and applications at the second site, without manual intervention for application data access, since

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application data remains available through the remaining VPLEX engines.

For true continuous availability, VPLEX is certified with clustering technologies such as VMware Fault Tolerance® and Oracle Real Application Clustering®. These technologies create an application cluster than can survive the loss of a single host without restarting the application. Whether in a single site or between sites, if the host and arrays are brought down, the remaining hosts can continue to operate without disruption, accessing the same distributed virtual volumes on the remaining VPLEX engines.

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2 TRANSFORM DATA MOBILITY

Traditional Data Mobility
As mentioned earlier, planned outages can be even more disruptive than unplanned outages. Consider the example of the tech refresh. When it's time for a new array to be brought into the infrastructure, a number of tasks must be carried out:

- Purchase and stand up the new array
- Coordinate with application owners to plan downtime
- Consider other applications that will be affected and include their owners in the discussion
- Remediate hosts and applications to ensure they will work with the new array
- Copy data from the existing array to the new array
- Test applications on the new array

This pre-planning can take months, and much of the implementation work must be done at night or on the weekend; and remediation and testing will involve application downtime. And while the new array remains unused, it's depreciating without adding value.

The final cutover typically takes place during a low-use period such as a weekend but, with little room for slippage, it's a race to be ready for Monday. Following cutover, there is always the risk that the new array and configuration will not be able to support production workloads, requiring a disruptive reversal from the new array to the old array.

IT organizations may need support from external professional services during the entire process resulting in additional expense.
EMC VPLEX for Non-disruptive Data Mobility

VPLEX enables non-disruptive mobility of application data. Hosts access volumes through VPLEX and VPLEX writes data to the storage arrays. When a new array is brought in, VPLEX takes ownership of the array and integrates it into the larger storage pool.

During a tech refresh, volumes containing application data on the existing array can be mirrored to the new storage array. As soon as the volumes are selected to be mirrored to the new array, a distributed virtual volume exists consisting of the same images on both the old and the new array. Reads and writes begin to be balanced across the images on both arrays simultaneously. Once the mirror is complete, the old array can be taken offline: the applications will continue accessing their data on the new array. The benefits of this include the following:

- **Eliminate disruption from migrations forever** - Migrate data from old arrays to new arrays without disruption to applications
- **Save money** - IT staff can conduct migrations rather than relying on professional services
- **Save time** - Conduct migrations during business hours without coordinating with application owners
- **Eliminate remediation** - Applications and hosts connected to storage through VPLEX don’t require remediation when arrays are replaced
- **Eliminate risk** - Easily roll back changes or alter changes on the fly with VPLEX
- **Speed time to value** - Bring storage into the infrastructure quickly and easily and realize the value sooner

![Diagram showing timeline and benefits](image-url)
Transform Operational Recovery

Traditional Operational Outage Recovery
Human error or data corruption may not bring down an array or a site, but can make the application data stored on an array unusable. IT organizations have traditionally relied on data backups or data replication to address the risk of operational outage.

Data backups protect application data by copying it to external media such as tape or disk at a remote location. But there are two main challenges with data backup:

- There is always a delay in the recovery point to the last good backup.
- When an operational outage occurs, IT organizations must access the backup media and restore data that could be hours, days or even more out of date. This is a long process to complete extending the recovery time.

With recovery points potentially being so far in the past and recovery time being measured on a calendar instead of a stop watch, this is often a last option for an IT organization, and never an attractive one.

Replication solves some of those problems by creating synchronous or asynchronous images of the data at the same site or a remote site, but this has the potential drawback of “garbage in/garbage out.” This means, if the production data was corrupted, then the replicated copy of the data will be corrupted as soon as the replication occurs, typically within milliseconds of the initial corruption, and certainly too quickly to mitigate.

To address this, IT organizations implement snapshot routines that set bookmarks in the replication process and allow for recovery from a last known good replica. But that results in a greater-than-zero recovery point that is often unacceptable for production workloads. Furthermore, coordination, management and maintenance of these snapshots can be challenging.

EMC RecoverPoint for Operational Outage Recovery
Under pressure to reduce the cost of data loss and downtime, many organizations are implementing continuous data protection. This enables any-point-in-time recovery, for recovery to the millisecond. EMC RecoverPoint enables you to bookmark specific points in time that might be used during a future recovery; and to create application-aware bookmarks that annotate specific points in time that are application-consistent. Once the data is recovered, you can re-start your applications.

By providing a write-by-write journal of all changes to a LUN, RecoverPoint gives you DVR-like recovery capabilities. IT organizations can quickly and easily recover to the last known good point for an application in order to recover from operational failures.

RecoverPoint is also designed with cloud in mind, supporting key high availability capabilities of server hypervisors such as VMware Site Recovery Manager®.
A COMPLETE SOLUTION FOR CONTINUOUS AVAILABILITY

EMC VPLEX and RecoverPoint work together to provide a complete solution for continuous availability. VPLEX provides the availability to survive unplanned outages and the mobility to avoid planned outages, while RecoverPoint provides protection against operational outages. With VPLEX and RecoverPoint you can build a trusted IT infrastructure that your business, your customers and your users can count on for access to applications and data, whenever and wherever they want.

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