

Replication Manager and SnapView for Replication on CLARiiON Storage Arrays

Best Practices Planning

Abstract

EMC provides the solution to achieve holistic recovery management through SnapView™ – an array-based local replication technology that provides snapshots and clones for CLARiiON® storage arrays. With the addition of EMC Replication Manager, companies can automate and streamline the process of local replication, eliminating complicated processes and scripting requirements while ensuring application-aware copies of key data.

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Executive summary

If data is the lifeblood of an organization, a company's business applications and databases are the conduits that ensure uninterrupted business. In fact, most organizations can tolerate very little downtime when it comes to the information contained within these mission-critical systems, especially now that industry standards and regulations dictate more stringent data retention and recovery measures.

Unfortunately, applications and the associated data are characterized by a growing level of frequent and unexpected change. With the continued proliferation of online processes, 24x7x365 operations, and environments characterized by multiple databases and interrelated applications, the window to shut down production systems and back up data has nearly disappeared. Organizations require easy and seamless access to copies of data, especially as Recovery Time Objectives (RTOs) and Recovery Point Objectives (RPOs) are driven down.

Organizations must ensure that the right information is in the right place at the right time – but at the right cost. Many companies are implementing an Information Lifecycle Management (ILM) strategy to address this issue. ILM assumes that all data has a tangible business value that tends to change over the course of its lifecycle, and thus, must be treated differently over time. For example, an internal memo that is critical today may be far less important a year from now.

EMC has witnessed a shift away from simple data backup to information recovery. Focusing on information recovery enables organizations to meet today's demand for fast access to secondary copies of data in a timely, efficient manner to ensure uninterrupted operations and real-time decision-making. Recovery management offers a holistic approach to storage, backup, and recovery that focuses on fast, reliable recovery as the aggregate goal of all information protection activities.

EMC provides the solution to achieve holistic recovery management through SnapView™ – an array-based local replication technology that provides snapshots and clones – running on low-cost, ATA- and fibre-based CLARiiON® storage arrays. With the addition of Replication Manager, companies can automate and streamline the process of local replication, eliminating complicated processes and scripting requirements while ensuring application-aware copies of key data.

By adopting the EMC Replication Manager/SnapView software solution for recovery management, organizations realize a host of business benefits, including the following:

- Simplified process for creating data replicas
- Reduced risk of data loss
- Lower management and maintenance costs, along with increased IT efficiency
- More rapid recovery times, even for groups of associated databases and file systems at the application level that may span different storage arrays
- Ability to share, protect, and manage real-world data throughout the enterprise without impacting production systems
- Ability to use replicas for value-added purposes, such as development and reporting

Introduction

As information growth explodes at corporations worldwide, backup and recovery needs are rapidly intensifying. Increased reliance on the information contained within databases and consumed by a variety of business applications has resulted in an emphasis on timely data recovery in addition to backup.

IT organizations responsible for supporting database applications are typically required to make multiple copies, or replicas, of their production installations for backup, recovery, reporting, test, and development purposes. Yet managing replicas is a complex undertaking, presenting a number of challenges. For instance,

organizations need to identify the host operating system supported, the relevant file system, and the host drivers that are in place, as well as determine the layout of primary and replication disk volumes.

In support of these requirements, many organizations develop command line interface (CLI) scripts, but writing replication scripts has traditionally been a time-consuming, complicated chore that requires the technical expertise of dedicated storage personnel. And the static nature of these scripts means they do not scale well. In fact, they must be modified in response to even the smallest change in the environment, such as adding more disks. To further complicate the issue, as the data volumes grow in the production database, backup procedures take longer and replication becomes more challenging to manage.

Today's business environment demands application-aware replication tools that automate the tedious manual processes associated with traditional replication scripts, enabling organizations – and a variety of users – to take advantage of local replication as part of their recovery strategy.

This white paper will provide an overview of the following and explain how organizations can use local replication to address their operational recovery issues:

- Recovery management
- EMC integrated solutions for operational recovery, including CLARiiON networked storage systems – CX3 UltraScale™ series and CX300 – SnapView software, and Replication Manager software
- Why SnapView and Replication Manager are the best solution for local replication on CLARiiON platforms
- Real-world application integration examples
- Operational benefits of the full EMC recovery management solution

Audience

This paper is intended for those interested in learning about the business drivers and technology best practices for implementing EMC SnapView with EMC Replication Manager as a solution for comprehensive operational recovery on CLARiiON CX3 UltraScale series systems.

Recovery management

SnapView and Replication Manager are part of EMC's portfolio of products that integrate to provide customers with comprehensive recovery management.

To ensure uninterrupted and fully supported business operations, backup and replication measures must address application awareness and integration along with the current manual scripting demands placed on IT storage, database, and application management personnel. Recovery management as part of Information Lifecycle Management (ILM) is quickly gaining mindshare as a strategy that helps address these issues. This strategic approach to recovery management utilizes disk-based protection to enable reliable operational recovery from any compelling event such as human error, application corruption, power outages, and other operational disruptions. When backup and continuous data protection (CDP) are combined with replication technology and tools that streamline and automate the replication process, disk-based protection with a focus on recovery becomes the foundation of an effective recovery management strategy. In fact, such an approach can significantly enhance data protection strategies by:

- Combining protection technologies for holistic benefit that are greater than the sum of individual parts
- Tiering recovery service levels
- Focusing on recovery, instead of solely on data protection
- Improving administration and manageability

Integrated solutions for operational recovery

EMC provides a comprehensive solution that allows organizations to achieve holistic recovery management. Included in this solution is the combination of seamless integration of SnapView, running on low-cost, ATA-, and fibre-based CLARiiON storage arrays, with Replication Manager, which provides host-based, application-centric management and automation for SnapView (among other EMC replication technologies, all managed through a single console).

While backup-to-disk plays a central role in operational recovery, CLARiiON's disk technology combined with SnapView and Replication Manager enable a holistic approach that ensures fast recovery of business-critical applications. SnapView enables local operational recovery, while Replication Manager streamlines the process by coordinating with the host/application to create the replica, managing the copy process to the second host, and handling all of the steps required in the event of a recovery.

CLARiiON storage systems

EMC CLARiiON storage systems enable organizations to deploy a full range of tiered storage options within a single platform. High-performance disk-drive technologies support mission-critical production volumes. At the same time, less-critical environments – such as development, test, or reporting – can utilize high-capacity/low-cost drives, and tape-emulating disk libraries can be used for backup and recovery operations.

CLARiiON also works with a full range of array-based replication software that delivers snapshots, clones, or mirrors without consuming valuable server cycles or LAN bandwidth. For instance, CLARiiON storage arrays and the SnapView enabler software support consistent-split technology for both clones and snapshots. Consistency technology covering SnapView snapshots or clones provides the capability to create an image of one or more databases that are database management system-restartable copies.

CLARiiON CX3 UltraScale series

For companies looking to achieve robust recovery management, the CLARiiON CX3 UltraScale series systems—the CX3 model 20, CX3 model 40¹, and CX3 model 80—scale system capacity and performance, simplify management in complex environments, and deliver increasing levels of information availability and protection for critical applications and data.

The UltraScale's native PCI Express interconnect delivers high bandwidth and low latency characteristics, and enables the CX3 series to deliver the industry's only full 4 Gb/s capability throughout the entire system. As an organization's requirements change, CLARiiON's unique virtual LUN technology can move data from one tier of storage to a higher or lower tier without disrupting the host application.

SnapView replication for CLARiiON

EMC® SnapView is an array-based software product that creates point-in-time snapshots and full-copy clones of production data. Through economical, disk-based consistent split and “instant restore” of production data, SnapView cost-effectively accelerates backup and recovery.

The software runs inside CLARiiON storage processors, providing the ability to efficiently create bit image replicas of a CLARiiON storage object (that is, a LUN) inside the storage system, without requiring any host processing resources. The replicated LUN may be a logical replica, called a snapshot, or a physical bit-for-bit replica, called a clone and also frequently referred to as a business continuous volume (BCV). A maximum of eight snapshots or clones can be created against a single source LUN. Snapshots can also be created from clones of a source LUN. Each snapshot represents a point-in-time logical image of the source LUN from which it is derived.

¹ The CX3-20 FC/iSCSI and CX3-40 FC/iSCSI support concurrent Fibre Channel and iSCSI connectivity.

With support for consistent operations in FLARE® release 19, organizations can create consistent local replicas using SnapView. The feature, called *consistent fracture* for clones and *consistent start* for snapshot sessions, ensures consistency of data across multiple related LUNs, as well as the integrity of any process that uses the copies. SnapView consistent fracture for clones provides users with storage-system-based consistent replicas. Storage-system-based consistency operates independent of the server application, meaning that it is not necessary to quiesce the application. Instead, the storage system pends any dependent writes during the process of establishing the consistent set of replicas. Additionally, because SnapView operates at the storage-system level rather than at the server-application level, it is especially beneficial in environments that have write-order dependencies across multiple applications. Data warehouses are common examples of such federated environments.

There can be up to eight LUNs in a consistent operation on CX300 and CX3-20 models, and up to 16 LUNs in a consistent operation on CX3-40 and CX3-80 models. This feature provides the most benefit in environments with multiple databases or applications that are interrelated, and/or proprietary databases and/or applications without a native hot-backup feature.

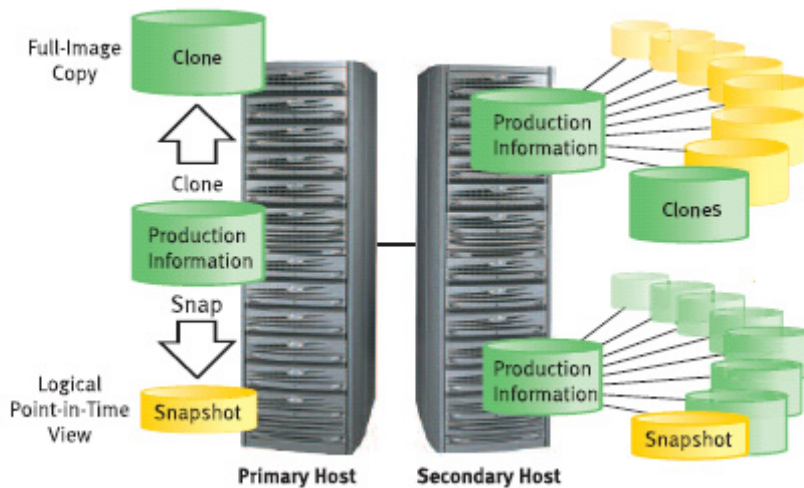


Figure 1. SnapView provides up to eight snapshots or clones to be used for fast disk-based restore to a logical point in time

Following are the critical SnapView features and operations supported by SnapView:

- Features:
 - Frequent point-in-time replicas
 - Restores to LUN
 - Protection from hardware failures
 - Performance
- Supported business operations:
 - Backup and recovery
 - Decision support and data testing
 - Data warehousing
 - Data reporting
 - Data propagation
 - User training

Support local clones and snaps

SnapView supports both local clones and local snaps. SnapView clone replicas – or BCVs – are full, exact copies of production data created using SnapView clones. Through clones, organizations can create a full

copy of a LUN that is equal in size to the source LUN. SnapView can present the clone to a secondary server as a unique LUN. SnapView will track all changed blocks and can incrementally reestablish the clone—copying only changed tracks to the clone to bring it back into sync with the original—or can incrementally restore the image from the clone back to the original volume.

A local snap – or snapshot – is a point-in-time copy that allows organizations to create an instantaneous virtual copy of a LUN that is immediately accessible for read/write activity. Snapshots comprise data that resides on the source LUN and on the snapshot cache, or reserved LUN pool. When the SnapView session is started, a point-in-time replica is created. After the start of the SnapView session, the production host is still able to write to the source LUN and modify data. When this occurs, the software stores a copy of the original data in the snapshot cache. This operation is referred to as *copy on first write* and occurs only once for each chunk of data that is modified on the source LUN. The resulting snapshot is fully readable and writable by a secondary server. Any subsequent writes made to the snapshot are written to the reserved LUN pool. SnapView also supports a feature called snapshot rollback, which provides the ability to restore snapshots directly to production volumes.

In general, clones should be created for large amounts of data that change frequently; snaps should be created for data that is more static. Clones always require the same amount of disk space as the source LUN. Snapshots, on the other hand, only require enough snapshot cache space to support the data that has changed on the source LUN (typically 10 percent to 20 percent of the source LUN size, but this will vary depending on how much data has changed). Also, clones typically take longer to create than snaps. However, snapshots may have a bigger impact on performance due to the amount of potential data copies required to synchronize the reserved LUN pool. This is especially true for source data that changes frequently.

Note: Clones do not pose a run-time performance impact once the clone has been created; snapshots have a performance impact on the use of production data once the snap has been created.

Replication Manager

EMC Replication Manager is a software application that simplifies the creation and management of disk-based replicas. Replication Manager automates the creation of exact point-in-time copies of mission-critical data that can be used for rapid recovery or repurposing. The software manages the creation of the replica from a pool of storage, eliminating the need to preconfigure or define an association with the production volumes. The lifecycle of the replicas is also seamlessly managed, ensuring appropriate retention and preventing user error.

Replication Manager automates the mounting, dismounting, scheduling, and expiration of replicas and can be used with multiple servers, applications, and storage arrays. Replication Manager allows replicas to be mounted, or exposed, to an alternate host. For example, a replica of an Oracle database may be started on a different system so that the replicated database can be examined without taking down, or restoring over, the original database. The database can also be mounted with a second name on the original system as an alternative to use of a second host for the mount.

In the case of a clone-based replica, Replication Manager provides an option in which a snapshot replica of the original clone replica is created and then Replication Manager mounts the snapshot. This option provides “discard changes on unmount” functionality, which enables attempts to repair a database without risk to the replicated copy of the data.

Advanced features such as configuration checker and autodiscovery of underlying technologies eliminate the need for specialized scripting skills. In fact, the configuration checker performs over 30 environmental checks during the installation and suggests remedies if necessary. This ensures that all required components are in place once the software is installed.

An intuitive point-and-click interface, menu screens, pull-down menus, and wizards simplify and automate the replication process. By automating the replication process, Replication Manager masks the underlying

complexities of IT environments, so that IT and other personnel do not need to worry about constant changes to infrastructure and the associated manual efforts to keep scripts up to date. And the software manages all replication jobs, allowing users to easily schedule, track status, and gain complete insight into replicas.

The software offers application-centric replication management for heterogeneous environments and supports EMC replication technology for all major operating systems, including Microsoft Windows 2000 and 2003, UNIX, HP, AIX, and RedHat Linux. It also supports all major applications, including Microsoft Exchange, Oracle, SQL Server and IBM UDB, to name a few. For full support of mission-critical environments, the software operates in both crash-consistent and application-consistent modes. With comprehensive support for application integration, Replication Manager enables replicas to serve the needs of application personnel.

The fact is that no disk-based replication technology does all of this easily and simply for the entire replication process—not without Replication Manager. Figure 2 displays the range of events associated with creating replicas.

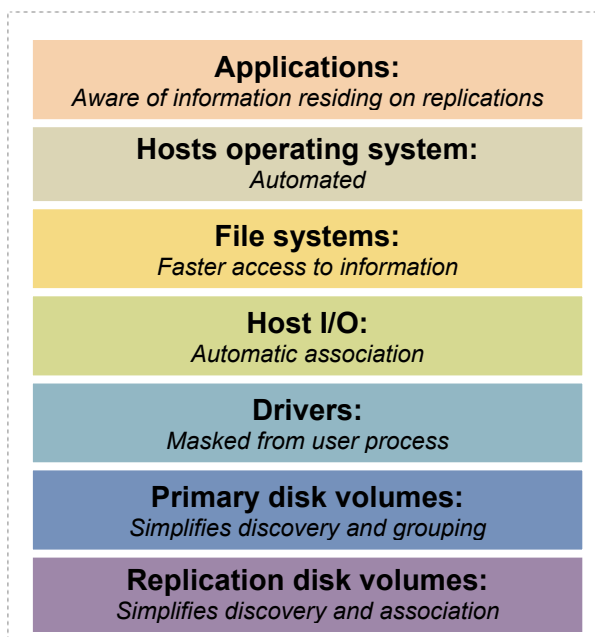


Figure 2. Replication Manager simplifies and automates the management of a range of events associated with creating replicas

Recently added client support includes Solaris 10, AIX 5.3, and HP-UX 11.23. Replication Manager supports Microsoft Exchange, SQL Server, and Oracle integration, along with Microsoft Volume Shadow Copy Service (VSS) and Virtual Device Interface (VDI) for application integration. Support for CLARiiON UltraScale CX3-20 and CX3-40 Fibre Channel/iSCSI arrays (which support concurrent Fibre Channel and iSCSI connectivity) enables organizations to take advantage of low-cost iSCSI connectivity while leaving open a path for future evolution to Fibre Channel.

The best solution for local replication on CLARiiON platforms

Replication Manager and SnapView are customized in a number of ways to offer the utmost value and benefit to CLARiiON users. On the CLARiiON arrays, Replication Manager can take advantage of both clone and snapshot functionality: It can store clones on a separate LUN or disk, store snapshots' first write to disk-based snapshot storage on the CLARiiON array, or store either on the CLARiiON CX series' ATA

disks. And Replication Manager can also leverage SnapView's consistent-split technology to create consistent copies of application data in heterogeneous environments. Replication Manager can even make an incremental SAN copy of a SnapView clone, enabling SAN copies within and between storage arrays. Instead of making a full copy, Replication Manager copies only changes when creating a SAN copy.

Replication Manager uses information obtained from the application server as the basis for controlling array-based movement of data to replication devices. And by executing replication procedures using the processing power of the storage arrays, Replication Manager helps ensure the availability of critical production applications.

Replication Manager jobs are "application centric," which means that they specify the logical object to be replicated (for example, a database) rather than a physical device. If storage changes for a database, Replication Manager will automatically replicate the changed storage. Replication Manager also integrates with the application and operating system to provide a "mount" functionality, which allows exposure of the replication to a separate server, or alternatively, to a different location on the original server.

Replication Manager even allows administrators to create and automate replicas without a deep understanding of the underlying storage or replication technology being used. This reduces the need for scripting and prevents administrators from having to learn a new set of commands to keep and maintain a manual replication process.

Manual script-based replication procedures lead to shortcomings that can compromise a mission-critical application. For instance, it is generally not practical for a user to test the restore procedure for a homegrown replication script. Possible flaws can include scripts that do not track changes in storage used by a database, or failure to properly quiesce a database or use consistent fracture technology where needed. Replication Manager automates this process, insulating the user from the possibility of such errors.

Replication Manager handles all communications with the array and supports the array's functionality and technology. By coordinating and automating all the steps required at the application, host, and array level for SnapView, Replication Manager makes the replication and recovery process easy. Users manage snaps and clones via Replication Manager's point-and-click GUI. Additionally, because Replication Manager operates at the server and application level, it can coordinate replicas of source LUNs belonging on different CLARiiON storage systems.

The software also incorporates application integration support so organizations can ensure successful and automated local replication. For instance, Replication Manager manages applications by actually instrumenting them, not just reading them. Replication Manager can put any database into a quiesce or application-consistent state. For those organizations with Oracle databases, scripting is no longer required. Organizations using Microsoft Exchange or SQL databases no longer need scripting to manipulate VSS and VDI.

Figure 3 shows how SnapView and Replication Manager work together.

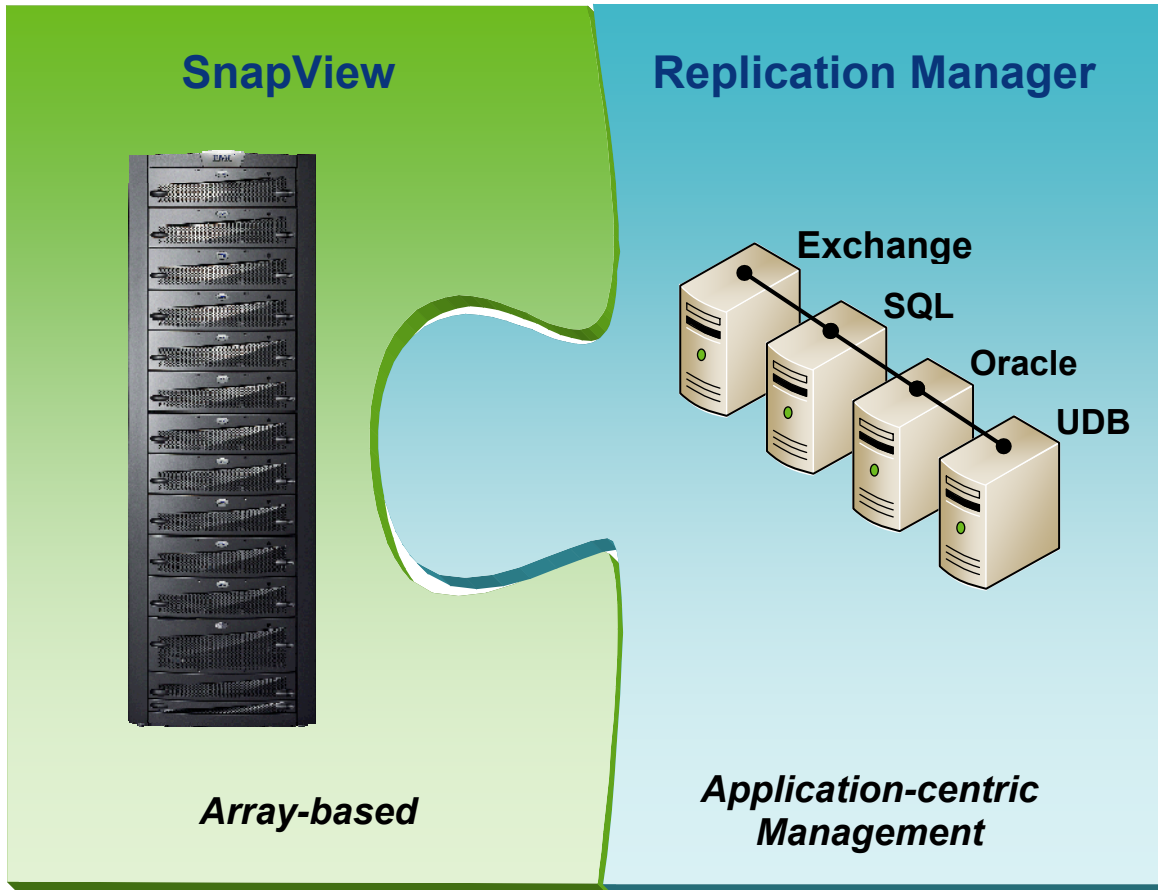


Figure 3. Together, SnapView and Replication Manager enable disk-based replicas with integration features, allowing the user to see replicas in context of the application

Operational recovery of applications

One of the most critical aspects of replication and recovery is direct integration with the database engine so operational requirements can be met during business hours. In fact, a replica of a database can be created frequently to support recovery operations. To effectively protect application data, replicas must be coordinated with application logic and process flow. The key is to create a system that uses both replicas and traditional backups by integrating the application and replication technology to maximize data protection with transactional consistency.

SnapView is designed to create snapshots and clones quickly and nondisruptively in database environments. By providing integration with Microsoft Exchange, SQL Server, and Oracle databases, among others, Replication Manager facilitates “hot” snaps and clones, greatly minimizing the impact on the production server of performing backup and restores.

“A key ingredient for replica automation software is an awareness of applications, databases, and replication technologies. A product like EMC’s Replication Manager provides integration between the underlying storage technology, and applications and databases. This software dynamically discovers changes in the environment and ensures that the replica is always a true representation of the production environment. This awareness eliminates the ongoing, manual re-scripting and testing that traditionally would be required.”

- Enterprise Management Associates, *Automating Replication Enables Business Agility*

Replication Manager handles all database mapping and leverages the native quiesce features within the given application (such as using VSS for Exchange or hot backup mode for Oracle) when establishing a consistent set of replicas. These replicas are valid backup copies of the data and are ready for immediate use by the secondary server.

Replication Manager uses specialized agent software to communicate with the database or file system that is being replicated. This architecture (shown in Figure 4) allows Replication Manager to support additional databases and file systems as they become available.

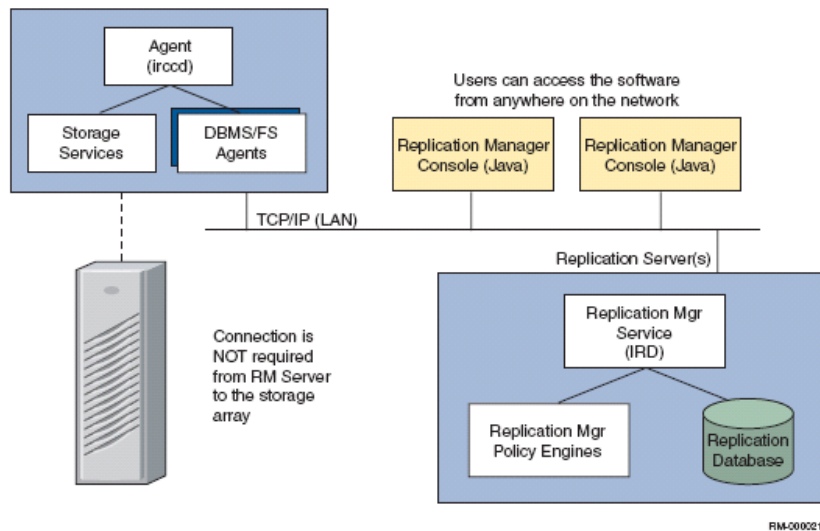


Figure 4. Replication Manager can easily support additional databases and file systems

Each Replication Manager software agent provides Replication Manager with a logical view of the data that resides on the storage array, allowing Replication Manager to:

- Specify which data to replicate
- Ensure that the data can be replicated safely
- Quiesce the database
- Return the database to normal operation
- Recover databases during mounting operations
- Shut down and/or unmount databases during restore operations

Integration with Oracle databases

Replication Manager supports Oracle databases that reside on either file systems or raw devices, and can create replicas of standard Oracle databases or Oracle databases that are clustered using Real Application Cluster (RAC) or Oracle Parallel Server (OPS). The software protects these databases by creating and managing application sets that contain one or more Oracle databases or specific Oracle tablespaces. These replicas can be mounted or later restored to the original production environment.

Before each replication, Replication Manager discovers the location of the data to replicate, and identifies the pathnames for all the datafiles in the requested tablespaces. Replication Manager then offers five different methods for creating a replica of an Oracle database:

- Without consistent split
 1. Online using hot backup mode
 2. Offline by shutting down the database
- With consistent split
 3. Online using hot backup mode
 4. Online without hot backup mode
 5. Offline by shutting down the database

Creating consistent-split replicas with hot backup mode

Oracle online replication with hot backup mode allows organizations to create a replica of the data while the database continues to serve data. Replication Manager puts the database into hot backup mode before using consistent split to create the replica. The software tracks changes to the database in an online redo log, and can later apply those changes to the database, after the point-in-time replica has been created.

While the Oracle database is in hot backup mode on the local host, a SnapView/Clone consistent split is performed. During this process, an image of the active database is created. This image can be used to perform a backup to tape by offloading this process to the remote or backup server. Using the SnapView clone reverse synchronization mechanism, SnapView clones can support a fast restore/recovery of the production database.

While the *restore* process is in progress, if there are any further changes to any of the production LUNs, those changes would not get propagated to the clones. Rather the clones remain as a *gold copy* backup set. Should the restore/recovery process fail for some unexpected reason, the same restore process can be restarted from the beginning. If the host-side application requests production LUN data that has yet to be restored, the CLARiiON storage system automatically pulls the appropriate data up from the clone. In other words, the production database can be restarted even before the true data-bit restore inside the storage system is completed.

The Replication Manager Oracle agent performs the following tasks:

- Catalogs the replica by copying all relevant information to the Replication Manager server database
- Saves the archive redo logs covering the time since the start of the replication (after the first new log was started)
- Enables Replication Manager to initiate and control mounts and restores of Oracle databases, archived redo logs, and control files
- Can mount a replica to an alternate host, as long as that host has an installed Oracle database server
- Can restore data to the production database server

The benefits of consistent split are as follows:

- Allows crash restart consistent copies of an online database
- Allows the user to get a replica that is physically closer to the original, not just logically
- Allows the user to disable hot backup mode if not required (for example, cloning and disaster restart replicas do not require hot backup mode)
- Replicates different types of databases on one host
- Makes mount all-or-nothing (if replication of one object fails, the entire replication fails)

Test results show that Oracle Database 10g and Automatic Storage Management can be deployed nondisruptively with the EMC SnapView clones whether consistency technology is being used.

Integration with Microsoft SQL Server databases

Replication Manager can protect SQL Server databases by creating and managing application sets that contain either entire SQL Server databases or partial databases at the filegroup level. The software supports SQL Server alone and installed in a cluster running Microsoft Cluster Service (MSCS).

Replication Manager offers three replication options for SQL Server databases:

- Full database
- Filegroup
- Consistent-split

In a full database replication, Replication Manager copies all the data and related transaction logs (for example, .ldf), which must also be located on disks in the same storage array as the data. For a filegroup replication, the software copies one or more filegroups (usually a subset of the filegroups that compose the database). Related active transaction log(s) are not replicated as part of a filegroup replication.

Replication Manager supports two consistent-split replica approaches – online with advanced recovery and online with limited recovery. For the advanced recovery option, Replication Manager uses Microsoft SQL Server VDI mode to quiesce the SQL data and also uses consistent split. For the limited recovery option, the software creates a replica and quiesces it with consistent split alone; Microsoft SQL Server VDI mode is not used.

Before each replication occurs, Replication Manager discovers the location of the data to replicate, and identifies pathnames for all datafiles and active logs in the dataset. Replication Manager creates the replica, and then the Replication Manager SQL Server agent thaws I/O to the database and the SQL Server database can resume normal operations, including writes to the database. The Replication Manager SQL Server agent catalogs the replica by copying all relevant information to its internal database. The agent also catalogs the locations of the datafiles, transaction log files, and the metadata file required for a restore or mount.

“The EMC technology has enabled us to build a storage solution which is flexible enough to accommodate our expected data growth and designed to meet our Basel II compliance needs...Our implementation of EMC SnapView and EMC Replication Manager means that we are able to restore the data warehouse in a matter of minutes, and perform off-host backups to our tape infrastructure.”

- Arthur Amos, Head of Technology Infrastructure, Nationwide Building Society

Integration with Microsoft Exchange databases

Replication Manager can replicate and mount one or more Microsoft Exchange storage groups or all storage groups in the instance, and automates SnapView operations to create and maintain Exchange database replicas. It also integrates with Microsoft VSS technology, enabling replicas to be used for backup or other secondary applications—without disrupting production systems. The software manages a number of functions and processes that enable automated local replication, including checking database integrity and coordinating the recovery process.

Before each replication occurs, Replication Manager discovers the location of the data to replicate and identifies pathnames for all the data in the requested storage groups. Each run of a Replication Manager local replication job incrementally synchronizes the Exchange database and log LUNs with their clones, overwriting the older backup replicas. Replication Manager also coordinates with VSS to have Exchange quiesce I/O just long enough (a few seconds) to fracture the clone set. It then mounts the clone replica (data and log LUNs) to the

mount host and verifies the integrity of the Exchange database and log files. Once replication is complete, Replication Manager automatically dismounts the clones from the mount host.

The Replication Manager Microsoft Exchange agent is a specialized module of agent software that enables Replication Manager to create replicas of Microsoft Exchange storage groups. It also allows Replication Manager to initiate and control hot split (online) or offline replications of Microsoft Exchange data at the storage group level.

In an Exchange /VSS environment, users can select full or copy as the replication option. For the full option, Replication Manager replicates the storage group(s), transaction logs, and checkpoint files, and then verifies the consistency of the databases and logs. For the copy option, Replication Manager replicates the storage group(s), transaction logs, and checkpoint files in the same way as it does during a full option, however, it does not truncate the logs. Copy replications are often intended for testing and diagnostic purposes only.

The Replication Manager Exchange agent can initiate and control mounts and restores of Microsoft Exchange replicas. The Exchange agent can mount a replica:

- To an alternate host in the same location as on the production host.
- On an alternate host in a new location (determined by adding an alternate root to the pathname).
- On an alternate host in a new location (determined by pathname substitution).

Replication Manager can manage either a partial (database only) or full (database and log) restore of Exchange replicas to the production Exchange server. When a Microsoft Exchange replica is restored, any of the following restore options can be chosen:

- All storage groups in the application set
- One or more storage groups from the application set
- One or more databases from the application set

“Replication Manager...is the heart of a CLARiiON DR [disaster recovery] solution...Replication Manager...and SnapView together deliver rapid operational recovery at the local site.”

- Mesabi Group, *Disaster Recovery Choices for Microsoft Exchange*

“We were able to take this store that continues to grow, have multiple copies of it, and back it up nightly without interference to the end user. There’s no downtime and it’s completely transparent. We can maintain the data indefinitely and easily scale on CLARiiON without running out of disk space or worrying about backup issues.”

- Jeremy Kahn, Assistant Vice President of IT, Hartz Mountain Industries, *EMC Customer Profile*

Integration with SAP applications

For SAP-based applications, Replication Manager automates host discovery and mapping functions for applications, file systems, replications, and storage. In addition, automated replication for SAP solutions (shown below) can help organizations reduce time to market and take advantage of new features sooner while minimizing upgrade or migration risks. These solutions help organizations manage replication processes through automated tools, and they provide BASIS administrators with self-service capabilities to refresh and replicate on-demand without IT intervention.

- **EMC Replication Accelerator for SAP Upgrades** is an EMC Proven Solution combining EMC Replication Manager, EMC services, and methodologies that accelerate the process of upgrading SAP

applications. (It is intended for upgrades from an older R/3 version to newer versions of SAP ERP.) The solution provides automated SAP storage replication processes to enable creation of on-demand replicas. And an intuitive graphical user interface makes it easy for SAP BASIS administrators and DBAs to automatically create on-demand production SAP database replicas without disruption, streamlining their upgrade processes.

- **EMC Replication Accelerator for SAP Productivity** is an EMC Proven Solution combining EMC Replication Manager, EMC services, and methodologies that streamline the generation of database replicas. It increases employee productivity by providing a “self-service” system copy and refresh capability. The solution provides CLARiiON customers with fast and reliable SAP production database backups during upgrades, delivering powerful new automated SAP production data cloning capability and a “one-click” automated cloning environment.

EMC Replication Accelerator for SAP Productivity can significantly reduce the development and testing cycles typically required for SAP upgrades by quickly and easily replicating databases for testing and backup purposes. It also simplifies the migration of data from the production environment to the test, development, and backup environments. If an error occurs during an upgrade, the production database can be quickly restored, allowing the upgrade team to continue making upgrade attempts within the upgrade time window. This increases the probability of completing the upgrade within the downtime window. If the upgrade is unsuccessful, however, the production system can be fully restored quickly from the backup copy, reducing the risk of prolonged downtime.

- **EMC's unique Automated BRBackup Replication for SAP solution** combines EMC Services expertise with EMC Replication Manager software, including split-mirror technology, to automate the SAP BRBackup replication of SAP production data, minimize performance degradation during backups, and lower risk and effort associated with traditional script maintenance.

Consisting of three phases, the solution assists organizations with the design and implementation of the ideal EMC Replication Manager server and client software components, and the configuration of pre- and postscripts, along with user profiles for system and database administrators. Expert and comprehensive knowledge transfer ensures that organizations gain the most from their Automated BRBackup Replication for SAP solution going forward.

EMC replication solutions for SAP applications offer a number of benefits, including the following:

- Enhances testing quality by reducing the risks associated with testing data subsets
- Enables automatic cloning of SAP production database quickly (generally within an hour) without extended downtime or disruptions to live operations
- Provides the ability to rehearse upgrade processes and assess downtime impact, mitigating risk during upgrade cutover
- Provides the ability to create test environments during production hours to shorten project duration
- Reduces the production impact during the final upgrade process, reducing costs
- Establishes ongoing SAP instance management and automated cloning best practices

“EMC Replication Manager has played a relevant role in our trans-continental product lifecycle management strategy, which includes replicating critical SAP databases across a tiered storage infrastructure, including EMC Symmetrix, EMC CLARiiON, EMC CLARiiON Disk Library, and EMC Centera platforms.”

- Piercarlo Cerrano, Chief Technology Officer, Fiat Auto

Operational benefits of the full solution

Together, SnapView and Replication Manager provide a comprehensive local replication solution customized for the CLARiiON CX series and CX3 UltraScale series arrays. The software solution delivers powerful and easy-to-use replication capabilities that increase data availability and data protection.

By taking advantage of the seamless integration of three industry-leading, award-winning solutions, organizations can realize a host of benefits. First, organizations gain from the unique benefits of each solution: CLARiiON storage allows organizations to optimize performance and scalability to meet any workload or capacity requirements and to suit specific operational needs. SnapView supports the creation of full clones or snapshots to meet any service levels and ensures data integrity of data stored on CLARiiON. And Replication Manager supports application integration so that organizations can derive deeper value from clones and snapshots. It also provides automation to ease the creation, management, and usage of SnapView clones/snapshots on CLARiiON arrays. These replicas provide an efficient source for backup processes – and for mission-critical data – while minimizing the impact on production system performance.

EMC SnapView and Replication Manager work together as a solution, allowing organizations to perform backups anytime, without concern for affecting other applications or business processes. And support for recovery straight from replica allows organizations to test recovery before impacting production. Deep integration with popular applications, such as Oracle, SQL, Exchange, and UDB, allows organizations to leverage their information storage infrastructure for the easy creation, separation, and reassignment of files and databases elsewhere in the infrastructure.

By linking replication and backup while providing advanced features – including the autodiscovery of applications – Replication Manager enables users who do not have specialized skills in scripting to easily benefit from local replication. And Replication Manager allows organizations to save valuable operations time by automating the mounting, dismounting, scheduling, and expiration of replicas. By enabling backup to, and recovery from, disk-based replicas, the Replication Manager and SnapView solution allows organizations to avoid the problems associated with tape-based backups, such as the following:

- Added processing load
- Performance impact due to extended time in quiesced or hot backup mode
- Increased time to back up to, and recover from, tape over disk

Organizations can use these replicas as point-in-time copies for backup, data warehousing, reporting and testing purposes, and most importantly, rapid data recovery. Basing automation on policies allows organizations to reduce operational costs and ensure best practices. At the same time, the reduction in reliance on scripting eliminates human error, which in turn speeds operations and improves application uptime.

A holistic approach to operational recovery enables organizations to share, protect, and manage data throughout their environment with ease. Ultimately, by removing the inherent complexity of replication technology and scripting and fully automating the replication process, this holistic recovery management solution enables organizations to maximize the value of storage and replication technology.

“Automating this process [replica of an Exchange, SQL, or Oracle database] via application-aware software greatly improves operational efficiencies and reduces the extent of application downtime by eliminating the need to recover from tape. Replication automation in combination with utilities such as SAP BRBACKUP, or integrated into the Microsoft Volume Shadow Copy Services (VSS) framework, for example, provide unique solutions for online and offline backup and recovery, and provide a certified process leveraging the offerings of the application vendors.”

- Enterprise Management Associates, *Automating Replication Enables Business Agility*

Conclusion

Any organization's backup and recovery strategy should be part of an overall information management and protection infrastructure. Outside of the traditional benefits—reduced operating costs and improved productivity, performance, and reliability—a strategic disk-based backup process with an emphasis on recovery needs will efficiently accommodate a full range of service-level requirements—both now and in the future.

EMC CLARiiON leads the midrange storage market in providing customers with cost-effective array-based storage solutions that deliver the highest levels of performance, functionality, and reliability. With the seamless integration of SnapView and Replication Manager on CLARiiON, end users can easily and quickly create and manage replicas.

In addition, organizations gain advanced recovery protection for Oracle, Exchange, SQL, and other applications. In fact, the solution enables those who administer business applications to create and manage their own replicas, without the intervention of storage experts. Essentially, the combination of CLARiiON, SnapView, and Replication Manager provides a holistic approach to operational recovery that enables instant backups and rapid restores using traditional backup infrastructure. The combined solution helps simplify and automate local replication while satisfying today's data protection needs.

References

- Enterprise Management Associates, *Automating Replication Enables Business Agility*, January 2005
- Mesabi Group, *Disaster Recovery Choices for Microsoft Exchange*, August 2005