

Replication Manager Foundations

Upon completion of this module, the student will be able to:

- List EMC's Replication Manager family of products
- Describe Replication Manager's functionality for both Replication Manager and Replication Manager SE
- Describe Replication Manager's architecture for both Replication Manager and Replication Manager SE
- List the applications supported by Replication Manager as per the support matrix
- Describe Replication Manager product family's benefits

The objectives for this module are shown here. Please take a moment to read them.

What is the Replication Manager Family

- Simplifies and automates the creation, management, and usage of disk-based replications
- Covers from entry-level to enterprise
- Supports the needs of both storage savvy personnel and storage novices
- A complete “grow-as-you-go” product portfolio

The Replication Manager family is a portfolio of replication management products designed to manage EMC's various replication products, whether they are local or remote replicas.

They all dramatically simplify the usage and management of disk-based replicas. The products range from mid-tier entry-level products to full enterprise-class. There are products for those with sophisticated storage expertise, and products for those who are application focused rather than storage experts.

Perhaps one of the most useful features is that the products are part of a family that can “grow as you go”, with upgrade paths and licensing.

Why Replication Manager

- Data loss has business impact
 - Employee productivity
 - Revenue loss
 - Damage to business reputation
- Data corruption and loss are at best unpredictable
- EMC Software solutions (Replication Manager) minimize impact
 - Fine RPOs
 - Short RTOs

Replication Manager addresses the issues facing business today by readying them for potential data loss, whether it be in the form of data corruption or physical failure of hardware. These types of disasters can have a devastating impact on the day-to-day operations of a business as data loss/corruption at a minimum, will slow down processes which results in a loss of revenue.

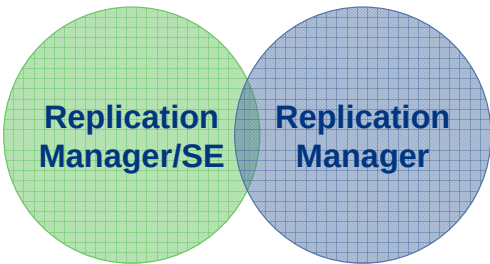
To counter these types of extended outages, Replication Manager allows you to create multiple replicas throughout the business day with minimal, if any, impact on the production environment. This results in the ability to finely tune the Recovery Point Objectives in stated service level agreements. Couple that with the ability to instantly restore data from disk-based replicas, and you achieve much better Recovery Time Objectives than legacy solutions could ever offer.

These advantages can be realized in both the enterprise arena with Replication Manager, as well as in the Small-to-Medium/Commercial space through the use of Replication Manager SE, both of which we will discuss in this module.



Replication Manager Family Portfolio

- Replication Manager/SE creates local Exchange, SQL Server, and filesystem replications on a CLARiiON
- Replication Manager manages local (within an array) application-focused replications for repurposing and rapid recovery



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EMC Replication Manager creates replicas of mission-critical information on disk arrays. The product can create a replica on BCVs and VDEVs (in Symmetrix storage arrays), or LUNs and snapshots (in CLARiiON storage arrays). Replication Manager creates replicas simply, quickly, and automatically. In fact, it can automate all the important procedures related to data replication.

The Replication Manager family is made of two products:

- Replication Manager/SE for CLARiiON, Windows, and SQL/Exchange customers in the commercial space
- Replication Manager covers the Replication Manager/SE features plus UNIX, Symmetrix, Oracle, and UDB

Note: Both Replication Manager/SE and Replication Manager are application integrated products.

Replication Manager/SE

- A simplified version of Replication Manager / Local focused on the mid-tier supporting:
 - CLARiiON only
 - Replication Manager SE for Celerra — Creates replicas of data on Celerra storage arrays using a Windows-based solution similar to the CLARiiON solution.
- Allows application-focused administrators to create, manage, and restore replications of:
 - Microsoft SQL Server databases
 - Microsoft Exchange databases
 - NTFS volumes
- Replication Manager/SE automatically controls the complexities associated with creating, mounting, restoring, and expiring data replicas.

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Replication Manager/SE is a commercial version of the Replication Manager product.

Replication Manager/SE makes it easy to create point-in-time, disk-based replicas of databases, or file systems, residing on existing storage arrays.

RM/SE can create replicas of information stored on EMC CLARiiON storage arrays in the following environments:

- Microsoft SQL Server databases
- Microsoft Exchange databases
- NTFS volumes

With RM/SE, it is possible to:

- Create point-in-time replicas of production data in seconds
- Replicas can exist on the same array as the production data, or on a remote array using SAN Copy
- Facilitate quick, frequent, and non-disruptive backups from replicas
- Mount replicas to alternate hosts to facilitate offline processing (for example, decision-support services, integrity checking, and offline reporting)
- Mount multiple replicas on the same mount host
- Restore deleted or damaged information quickly and easily from a disk replica
- Set the maximum number of replicas for replication jobs so that replication storage is made available automatically

RM/SE automatically controls the complexities associated with creating, mounting, restoring, and expiring data replicas. The RM/SE Explorer offers an easy-to-use interface to help the customer manage and control these replicas.

Replication Manager

- Replication Manager discovers, automates, and manages local application-focused replications for repurposing and rapid recovery
- Replication Manager can create replicas of information stored in the following environments:
 - Oracle databases
 - UDB databases
 - Microsoft SQL Server databases
 - Microsoft Exchange databases
 - UNIX file systems
 - Windows NTFS
- Replication Manager can connect to storage arrays, such as:
 - EMC Symmetrix arrays
 - EMC CLARiiON arrays

Replication Manager covers all the Replication Manager/SE features, plus support on Symmetrix with TimeFinder family, UNIX platforms, and the Oracle and UDB applications.

Replication Manager provides a single management point for multiple hosts being managed and is better suited to more complex uses, such as repurposing.

EMC Replication Manager makes it easy to create point-in-time replicas of databases and/or file systems residing on existing storage arrays. Replicas can be stored on Symmetrix BCVs, Symmetrix VDEVs, CLARiiON Clones, or CLARiiON Snaps.

Replication Manager can also use SAN Copy to create replicas on a separate CLARiiON storage array.

Replication Manager can create replicas of information stored in the following environments:

- | | |
|----------------------------------|------------------------------|
| • Oracle databases | UDB databases |
| • Microsoft SQL Server databases | Microsoft Exchange databases |
| • UNIX file systems | Windows NTFS |

The software has a client/server architecture. With Replication Manager, it is possible to:

- Create point-in-time replicas of production data in minutes
- Facilitate quick, frequent, and nondestructive backups from replicas
- Mount replicas to alternate hosts to facilitate offline processing (for example, decision-support services, integrity checking, and offline reporting)
- Mount multiple replicas on the same mount host
- Restore deleted or damaged information quickly and easily from a disk replica
- Set the retention period or the maximum number of rotations for replicas to tell Replication Manager how to determine when a replica should be expired

Replication Manager has a generic storage technology interface that allows it to connect to storage arrays, such as EMC Symmetrix arrays and EMC CLARiiON arrays.



Replication Manager Family Masks the Complexity

Applications: <i>Aware of information residing on replications</i>	Replication Manager Family Provides: • Discovery of hosts, applications, and storage • Mount and unmount replicas to one or more hosts • Navigation between storage, host, and application • Automation of the entire process and integration of pre- and post-processes • Catalog information • Built-in scheduler
Hosts Operating System: <i>automatic</i>	
Filesystems: <i>Faster access to information</i>	
Host I/O: <i>Association automatic</i>	
Drivers: <i>Masked from user process</i>	
Primary Disk Volumes: <i>Simplifies discovery and grouping</i>	
Replication Disk Volumes: <i>Simplifies discovery and association</i>	

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Replication Manager has a generic storage technology interface that allows it to connect to storage arrays, such as:

- EMC Symmetrix arrays
- EMC CLARiiON arrays

Replication Manager Family makes replication and recovery very simple. That simplicity comes from a top-down implementation where the Replication Manager family can do a variety of things, such as discover, associate, navigate, automate, catalog, and schedule all replication tasks. Working from the application all the way through the volumes that are replicated, Replication Manager family simplifies this process with a wizard-driven interface.

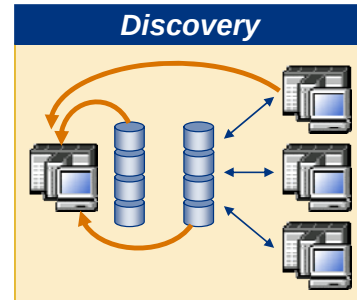
The next slides will illustrate the following features from Replication Manager family, as well as its benefits:

- Automated Discovery
- Restore Replicas
- Process Automation
- Integrated Support

Automated Discovery

Replication Manager Family automates the discovery process for:

- Hosts in the environment
- Type of operating system on each host
- Filesystems on each host
- Database(s) on each server
- Storage arrays that are available
- Available storage in each array



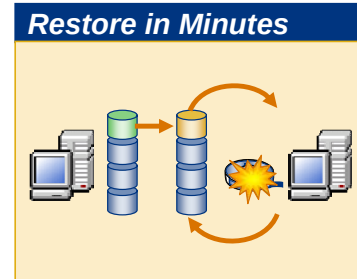
The automation behind the Replication Manager family is where the real value of this product is. Auto-discovery of hosts, filesystems, operating systems, databases, and storage add to the value Replication Manager provides. All replication processes are automated to allow for the scheduling of events, including mounting replicas to alternate hosts, recovering from replicas, expiring replicas, and initiating external backups.

The Replication Manager Family offers application transparency to hide the underlying complexities associated with replicating complex databases. It insulates the user from needing to know the inner workings of the database being replicated, and even how the underlying replication technology is being deployed.

Dynamic Volume Mounting enables the mounting of replicas to alternate hosts automatically based on replication policies set by the user. It provides operating system, filesystem, and database awareness. Some benefits from automated discovery are the reduced complexity required to set up and use replication, elimination of errors inherent in manual processes, and cataloging of all information and changes when they occur.

Restore Replicas

- Restore replica back to production
 - Disk to disk eliminates tape
 - Restore the entire replica or restore part of a replica such as:
 - A single tablespace
 - A single Exchange database
- Once a replica has been restored, the Replication Manager agent can restart the application using different methods
 - Full Recovery, No Recovery, Standby Mode
- Test recovery on another server before impacting production

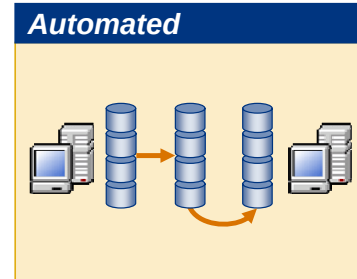


One major feature of the Replication Manager family is its ability to facilitate a finer level of granularity with restore. Now, users can browse a catalog of filesystems, databases, and tablespaces for which they have replicas. The result is the ability to perform an instant restore without the need to go to tape. This can eliminate hours in the recovery process and, depending on the scenario, may allow the application to be restarted in minutes. This results in improved recovery times, reduced effort, and improved data management.

Process Automation

Set up and execute your processes to best fit your needs:

- Schedule events
- Kick-off events through the GUI
- Integrate pre- and post-processes
- Mount to other RM clients
- Set expiration period for replicas
- Backup to tape
- Initiate recovery manually when needed



The automation of replication Jobs leverages the automated discovery capabilities of Replication Manager family.

Process automation steps through whatever process is required to manage the replicas to meet the business needs. Some benefits from process automation are improved IT scalability, decreased manual errors, and the enabling of knowledgeable staff to focus on improving business processes (NOT day-to-day movement of data).



Integrated Support Within the Replication Manager Family

Applications

- Oracle
- Exchange
- SQL Server
- UDB

Filesystems and Volume Managers

- UFS
- VxFS
- NTFS
- HFS
- JFS
- VxVM
- HP LVM
- AIX LVM
- Sun LVM

Replication Technology

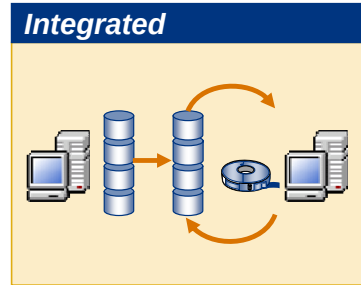
- Microsoft VSS
- Symmetrix
 - TimeFinder/Mirror
 - TimeFinder/Snap
 - SRDF/Synchronous
 - SRDF/Asynchronous
 - ECA (consistency)
- CLARiiON
 - SnapView clones
 - SnapView snapshots
 - SAN Copy

Operating Systems

- Windows 2000, 2003
- Solaris
- HP-UX
- AIX
- Linux

Clusters

- LEGATO AAM
- MSCS
- VCS
- HACMP
- Sun Cluster
- HP Service Guard



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There is a wide variety of support required to enable a product to manage replicas in a heterogeneous environment. This slide shows a list of the major components that are supported. See the latest Replication Manager support matrix for the latest updates.



Why Customers use Replication Manager

- Console based management and control
 - Transparent operations
 - Logical view of production data and replicas
- Point-in-time, non-disruptive replicas
 - Simultaneous with production
 - No down time
- Alternate host format for offline processing
- Simplified recovery processing
- Interface independent of individual storage technology
- Multiple disk array capability



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The Replication Manager family automates, simplifies, and manages disk-based replications. The application provides a layer of transparency to underlying complexity. It insulates the user from the storage environment, replication software being used, the type of server, the operating system, disk volumes, etc. For the short-term, Replication Manager can be thought of as “media management for disk-based replicas” and more. Replication Manager helps customers manage replicas as if they were tape cartridges in a tape library unit. Replicas may be scheduled or created on demand, with predefined expiration periods and automatic mounting to alternate hosts for backups or scripted processing. Individual user logins, with levels of access security, ensure system and replica integrity.

In addition to these features, Replication Manager is designed to be much more. It is fully integrated with many critical applications such as Oracle, Microsoft Exchange, etc.

With Replication Manager you can:

- Create point-in-time replicas of production data in seconds
- Facilitate quick, frequent, and non-disruptive backups from replicas
- Mount replicas to alternate hosts to facilitate offline processing (for example; decision-support services, integrity checking, and offline reporting)
- Restore deleted or damaged information quickly and easily from a disk replica
- Set the retention period for replicas to automatically free storage

Replication Manager automatically controls the complexities associated with:

- Creating and expiring storage mirrors
- Managing available storage in pools
- Mounting mirrors to alternate hosts

Lesson 2 – Replication Manager Architecture

Upon completion of this lesson, you will be able to:

- Discuss the Replication Manager Architecture Components:
 - Console
 - Server Software
 - Client Software
- Review the Component Communication Flow
 - IRD
 - IRCCD

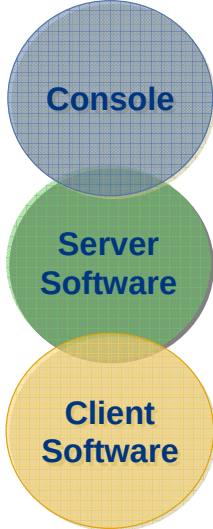


The objectives for this lesson are shown here. Please take a moment to read them.



Replication Manager Components

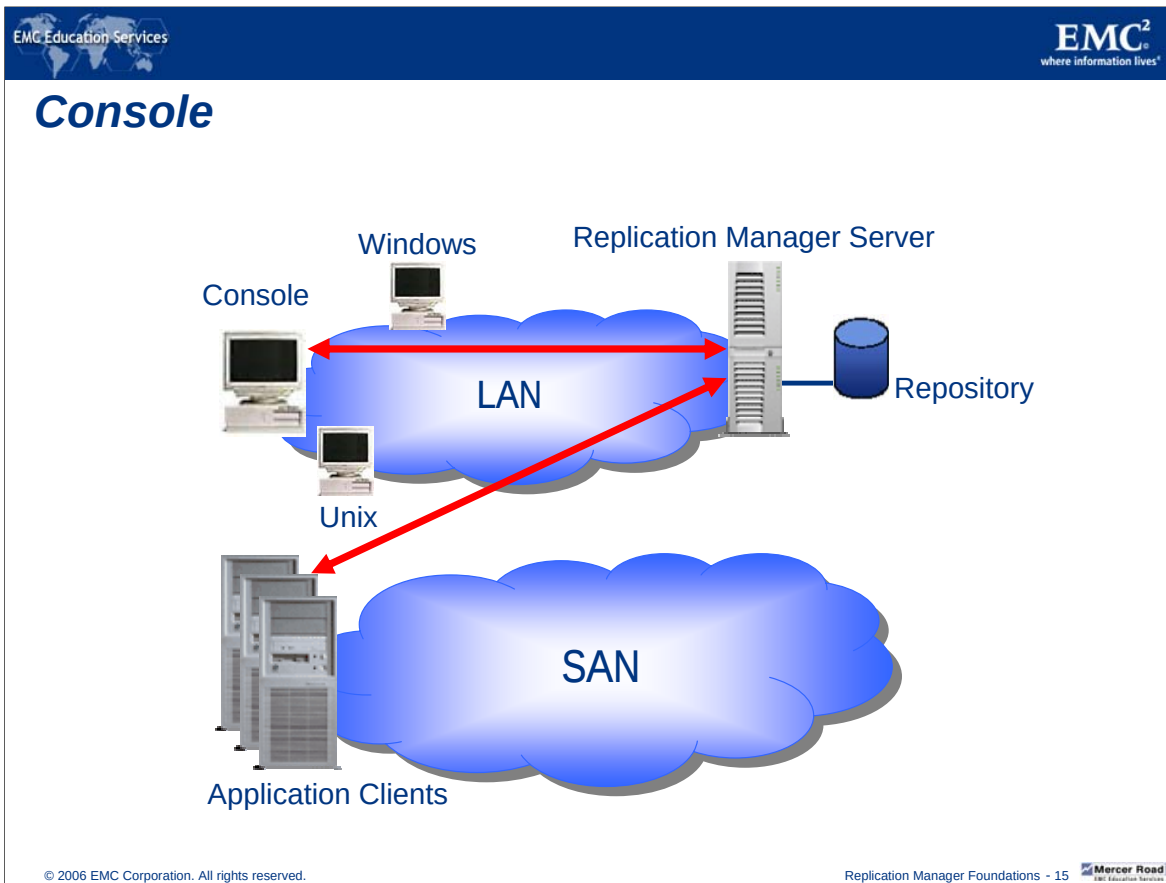
- Console
 - Java based
- Server Software
 - Replication Manager Daemon (IRD)
 - Policy Engine
 - Replication Manager Database
- Client Software
 - Client Control Daemon (IRCCD)
 - Storage Services
 - Modular Agents



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The Console is the user interface for Replication Manager. It is a Java-based application that allows you to access and control your storage resources; create, mount, and expire replicas; and manage schedules locally or remotely. This component controls the Replication Manager system from any Windows desktop machine or server.

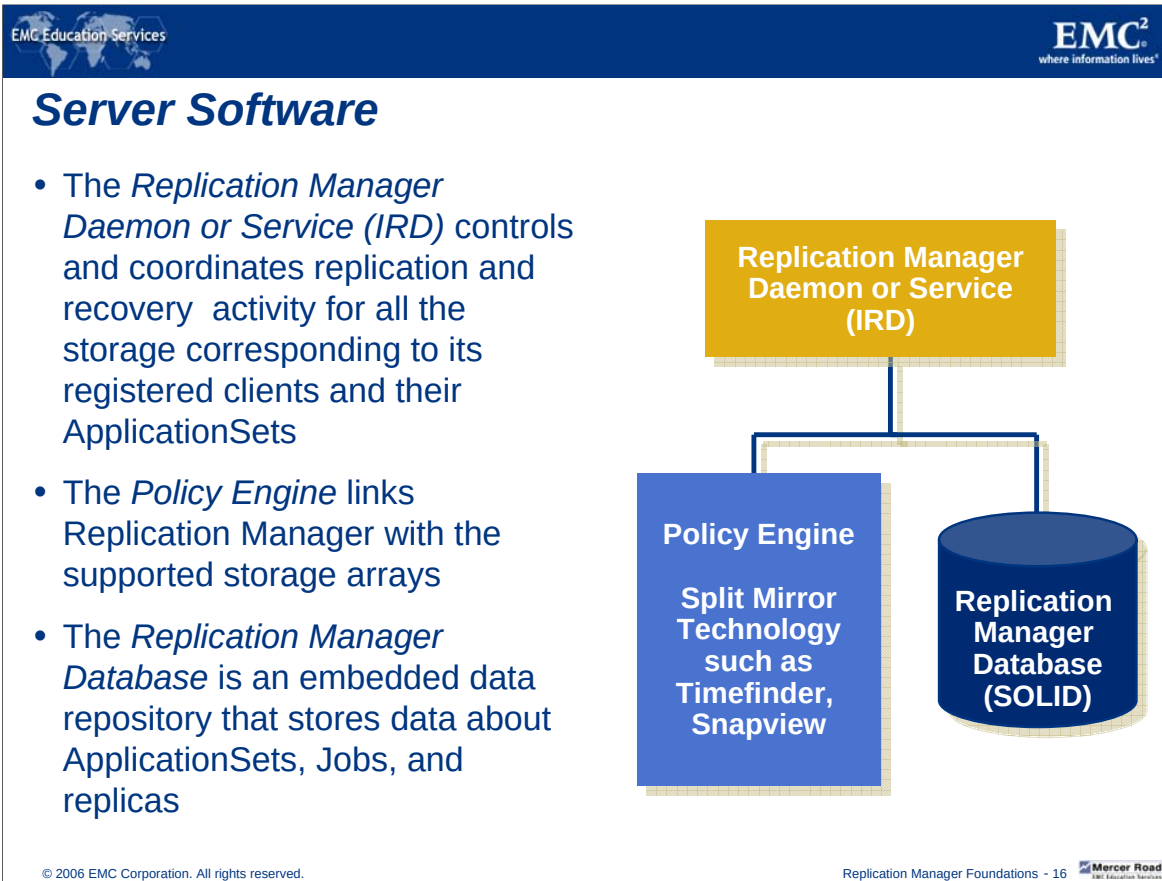
The Replication Manager Server processes all user requests and keeps track of all Replication Manager-managed replicas in the embedded repository. There is no direct communication between a Replication Manager Console and an application client. This component consists of core software binaries, log files, and an embedded data repository containing configuration data that describes each replica created and the storage associated with that replica. The server component resides on the replication server host.



The Application Clients are agents that manage specific objects such as databases and file systems. The Replication Manager client software links to the storage array and manages that connection, including the communication with it.

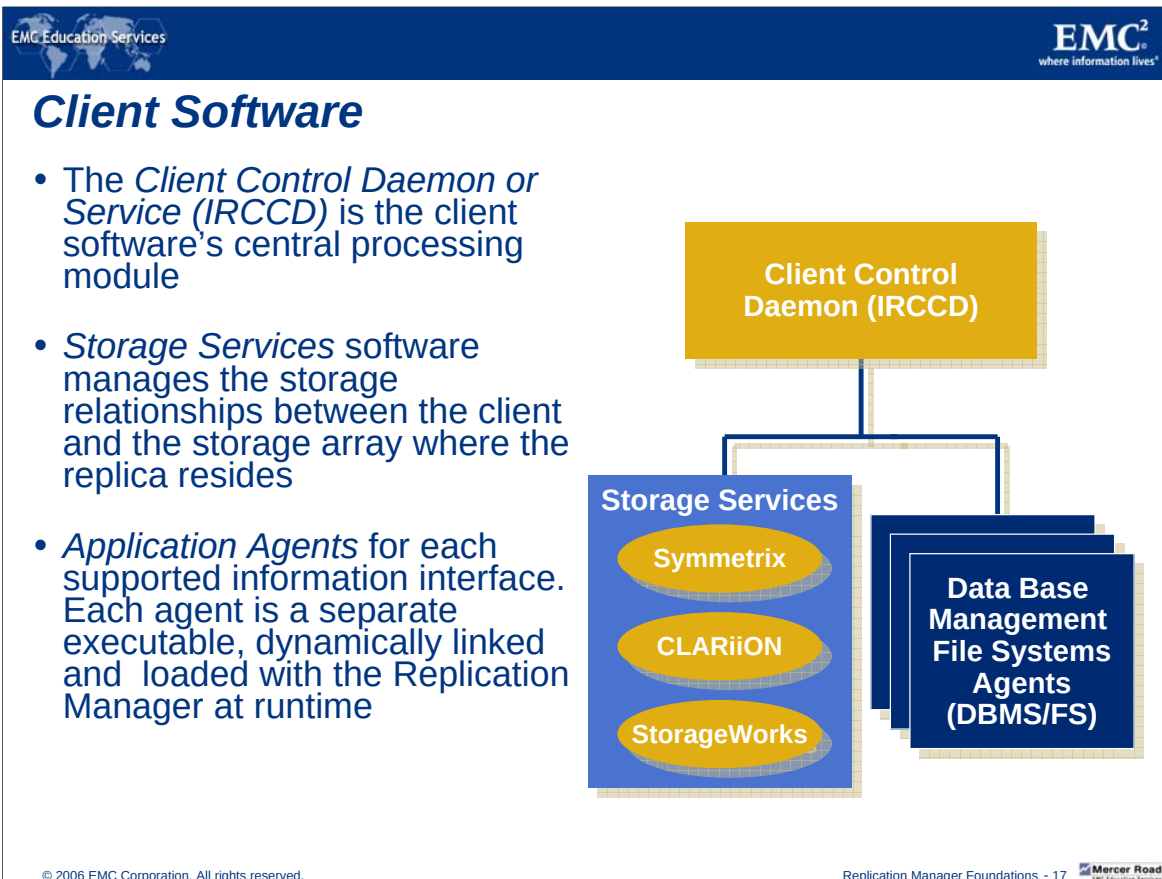
Replication Manager Architecture allows users to access the software from anywhere on the network. The Replication Manager Console lets the customer control Replication Manager from any Windows NT/2000/XP/2003 workstation that has the console installed and has a TCP/IP connection to the server and the hosts.

Storage Policy Plug-ins select the best mirrors for replicating a set of sources, while Storage Service Plug-ins access arrays to identify and manipulate the storage.



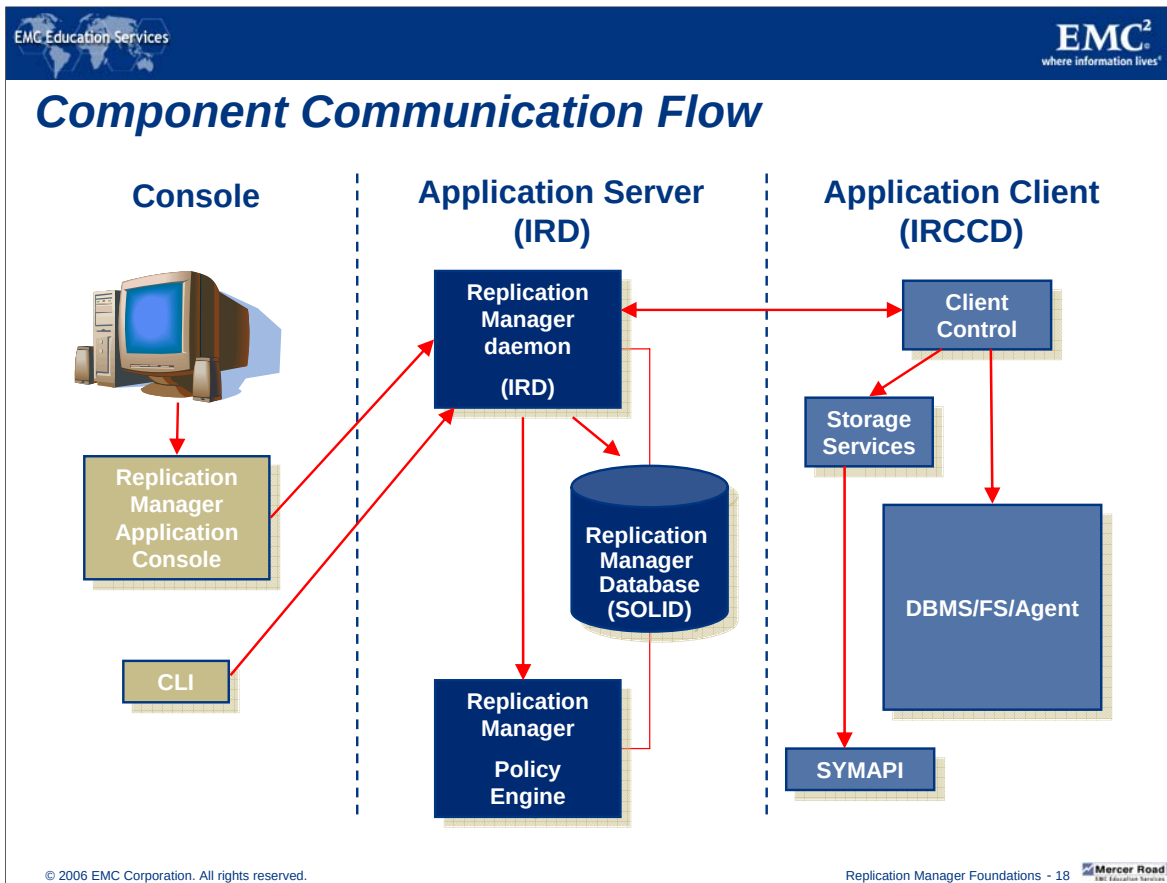
The server software is installed on the server that controls replication Jobs and stores data about each replica. The server software has three distinct components:

- Replication Manager Daemon controls and coordinates replication, expire, mount, and recovery activity for all the storage corresponding to its registered clients and their ApplicationSets. The Replication Manager Daemon handles all requests from the Console. The server verifies the authentication of users logging in to the Replication Manager system, both from the Console and the CLI.
- The Policy Engine links Replication Manager with the supported storage array technologies. The policy engine is a dynamic library that links to the Replication Manager Daemon. The policy engine is Storage Policy and works with the Storage Service on the client to determine which mirror volumes to use for a replication. The Storage Policy plug-in uses an algorithm to choose the best device, whether it is a clone or BCV, to use for the replication. The algorithm attempts to maximize performance by choosing mirrors based on their position on the disk adapters and whether they have been previously used in a cloning operation. The latter situation marks the device as a candidate for incremental synchronization.
- The Replication Manager Database is an embedded Database that stores data about ApplicationSets, Jobs, and replicas. The IRD daemon is responsible for maintaining the Database. The Database holds information about replicas, Jobs, users, clients, etc., that Replication Manager needs to run the application and maintain its existing state.



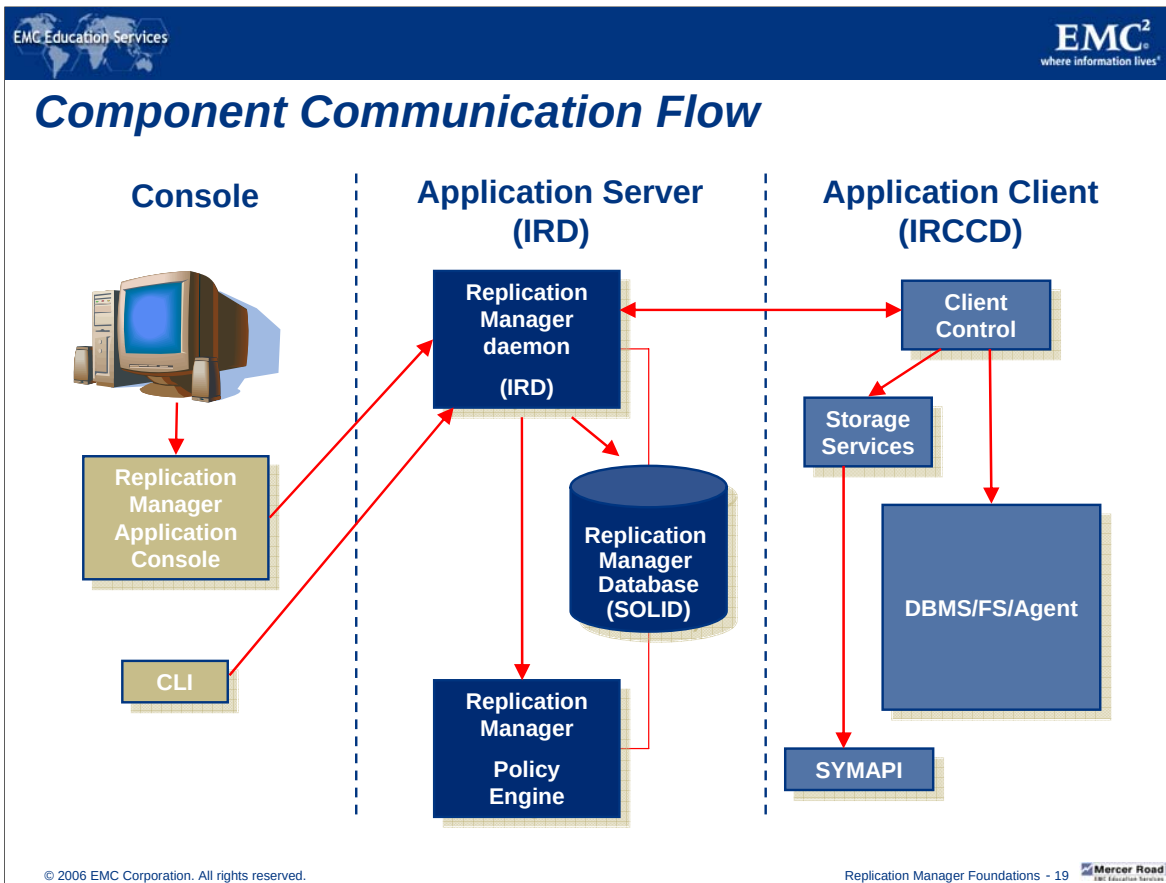
The client software is installed on each host that participates in the replication process, including hosts that manage production data and hosts that are used to mount replicas. The client software also has three distinct components:

- Client Control Daemon (IRCCD) is the client software's central processing module. It listens for incoming connections from the Replication Manager Daemon and then handles and coordinates all operations on the client.
- Storage Services software manages the storage relationships between the client and the storage technologies used to create the replicas.
- Modular Agents for each supported information interface. Each agent is a separate executable, dynamically linked and loaded with the replication daemon at run time. The agents provide the intelligence to support the application or filesystem that will be replicated. Supported agents are:
 - Oracle
 - SQL
 - Exchange
 - UDB
 - NTFS
 - Unix



Steps that occur when a user requests a replica of an application:

1. IRD reads application information stored during ApplicationSet and activity creation from SOLID.
2. IRD initiates a connection to the IRCCD on the appropriate client from the information retrieved in step 1.
3. IRD passes this information on a start message to IRCCD with the application information.
4. The IRCCD loads the appropriate application agent plug in.
5. The IRCCD calls the agent plug in to do a discover called "getBrowseTree". The browse tree is a tree representing the application down to the file or raw device level. This information is returned to the IRD.
6. For each file or raw device, the IRD calls the client to do a storage discover.
7. The client queries the storage agents in a round robin fashion until it finds one that can resolve the storage. The details are sent back to the server.
8. The storage information is sent to the storage policy agent which selects an appropriate technology based on the details and the pool selection.



The Replication Manager client sends a prepare checkpoint command to the storage service agent, which then issues the appropriate SYMAPI calls to establish the standard(s) and BCV(s). When there are no more invalid tracks, the application agent will send a freeze request to the application or, in the case of a filesystem, continue with the split. The storage agent is responsible for sending the appropriate SYMAPI commands to split the standards from the BCVs. When the split is complete, the application agent will send a thaw request to the application. Status updates are sent from the Replication Manager client to the Replication Manager server, which forwards the information to the Replication Manager Console.

The Replication Manager server receives notification that the replica has been successfully completed and updates the SOLID Database with information about the replica.

The Replication Manager server passes the list of Symmetrix devices on to the Multi-BCV Replication policy engine, which selects the BCV storage from the list of usable storage. The multi-BCV replication policy engine uses built in pairing algorithms to pick the requisite number of BCV volumes from the storage pool assigned to the activity. The Replication Manager server updates the Solid database and communicates progress information to the Replication Manager GUI application which updates the replica status window in the Console. The Replication Manager server sends an execute replica command to the Replication Manager client on the production host.



Storage-Array Requirements

- **Symmetrix Software Requirements:**
 - Microcode releases 5x66, 67, 69, 70, and 71*
- **CLARiiON arrays supported:**
 - CX300, CX300i
 - CX400
 - CX500, CX500i
 - CX600
 - CX700
 - CX3-20
 - CX3-40
 - CX3-80
- **To SANCOPY a CX400 or above is required**
- **CLARiiON FLARE Releases 14,16, 19, and 22**

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Symmetrix

Replication Manager 4.0.0 supports Enginuity versions 5x66, 67, 68, 69, 70, 5670, 5671, and 5771. Enginuity Version 5x66 is the earliest supported version of microcode although some functionality requires later versions.

Note: Replication Manager is “tolerant” of 5671 but it does not support new functionality such as Open Replicator. Replication Manager continues to support 5670 features. Replication Manager support for additional functionality in 5671 is planned for future releases and will be announced as work is completed.

CLARiiON

Replication Manager supports CLARiiON storage arrays and SnapView, both BCVs and snapshots. SANCOPY from a CLARiiON array to a CLARiiON array is supported. Note that in a SANCOPY environment, at least one of the CLARiiON arrays must be a CX400 or above. Replication Manager supports CLARiiON FLARE™ releases 14, 16,19, and 22 only.

Host Considerations – Client to use CLARiiON

- Install the following software on each Replication Manager client:
 - EMC Solutions Enabler (multithreaded)
 - EMC CLARiiON Navisphere Agent
 - EMC NaviCLI including Navisphere Classic and Navisphere Java
 - EMC ADMSnap

- Modify the clarcnfg file found in the:
 - /var/symapi/config directory (UNIX)
 - C:\Program Files\EMC\symapi\config\directory (Windows)

```
#####
#
#          CLARIION CONFIGURATION FILE TEMPLATE
#
# This CLARiiON configuration file serves to provide network addresses (be
# they hostnames or IP addresses) for the two Storage Processors on each
# FC4700-based Clarilion which can be seen by this host. In order to load
# information about Clarilion systems, SYMAPI must be able to communicate with
# the Navisphere Agent which administers them. With 4700-based Clarilions,
# this agent resides inside the Storage Processors, and communicates via the
# IP network. SYMAPI Discovery will not find 4700-based systems which do not
# have a valid entry in this file.
#
#
# CLARiiON Arrayname      Storage Processor A      Storage Processor B
# -----
# F20004001169            losat246                lcsat247
#
#####
# This is a sample config. Please use this format for your array.
#
# F20004001169            losat246                lcsat247
# F60004400875            fc4700u02spa            fc4700u02spb
```

The RM user must install the following software on each client machine used for Replication Manager, and configure the system to recognize the CLARiiON storage arrays.

- SnapView Admsnap 2.9. x.x.x
- Navisphere Host Agent 6.19
- Navisphere CLI 6.19 (requires Java 1.4.2_06)
- PowerPath (refer ESM for specific versions)
- Solutions Enabler 6.0.3 or 6.2

Also, when using CLARiiON storage, you must update the CLARiiON configuration file. This file can be found in the /var/symapi/config directory (for UNIX) or C:\Program Files\EMC\symapi\config\directory (for Windows).

The file should contain the serial number and the IP address or network name of each storage processor (A and B) in three space-separated columns in the file. Make one entry for each of the CLARiiON storage arrays that exist in your environment. Any comment lines should precede the line containing the serial number.

This file can contain information about a single array, or information for a list of arrays (one per line) if you have more than one in your environment.

A sample clarcnfg file is shown in this figure.

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Components of the Main Window

- The main window can be separated into distinct parts

Name	Platform	Agent Version
Ime108	Windows 2003	4000
Ime109	Windows 2003	4000

tree panel

content panel

Ready

Ime108 [65432] - Administrator

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The main window can be separated into the following distinct parts:

- Tree panel - Left panel containing a folder structure
- Content panel - Right panel with information about the selected element(s)

Five Levels of User Accounts

- ERM Administrator
- Power DBA
- Database Administrator
- Power User
- Operator

Operator — Has limited privileges to execute existing jobs to which the user has been given access, schedule those jobs, and view properties associated with application sets to which they have been given access.

Power User — Has all privileges of the Operator role as well as privileges to configure new application sets and jobs.

Database Administrator — Has all privileges of the Power User role but also has the rights necessary to restore a replica created by a job to which they have access.

Power DBA — Has all the privileges of the Database Administrator role, but also has rights necessary to configure storage pools.

ERM Administrator — Can perform every function available within Replication Manager, such as register new hosts, add and modify users, include storage, exclude storage, and access all components without any restrictions.

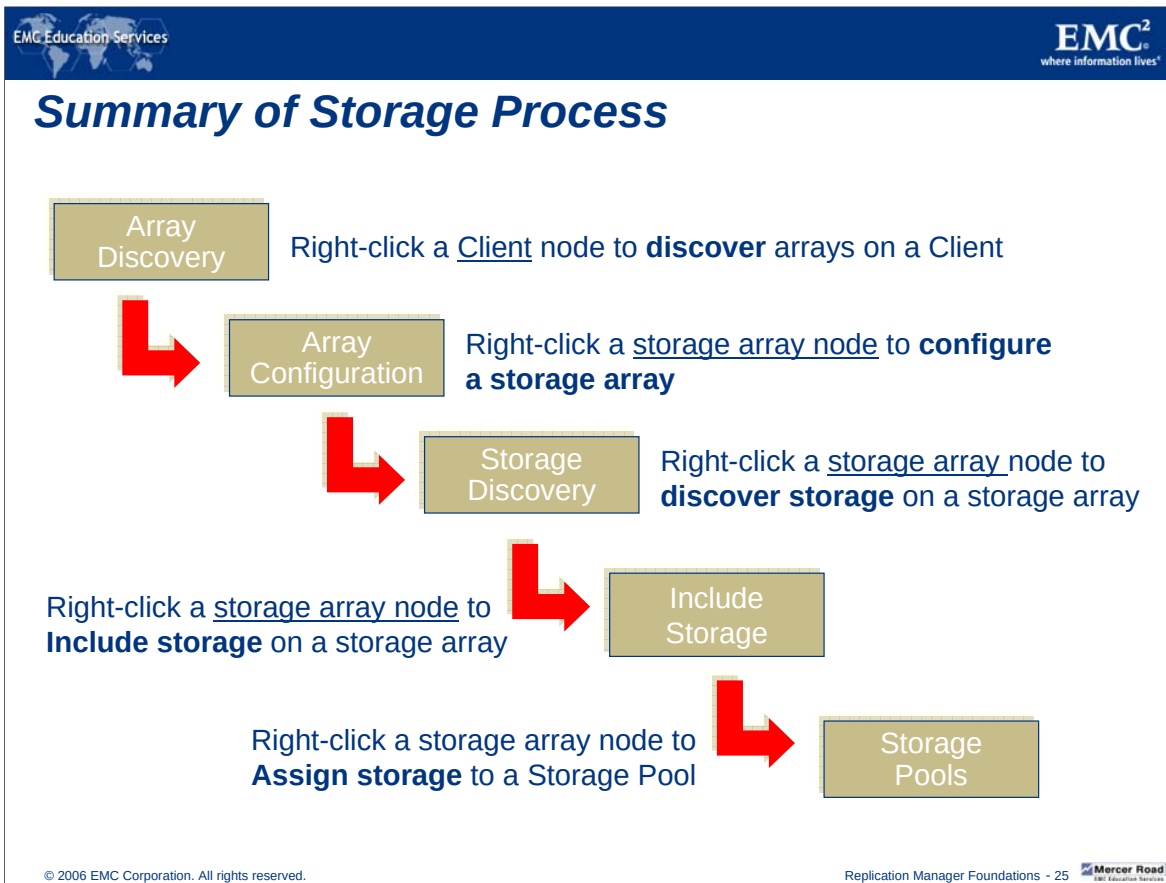
User Accounts - Security Basics

- Separate login per user
- Some objects in the system are shared
 - Hosts, storage
- Other logical objects belong to the user that created them
 - ApplicationSets
 - Jobs
 - Replicas
 - Schedules
- Access can be granted to other users
 - Capabilities depend on their role
- Secure client mode

The Replication Manager Administrator login is used to define logins and passwords and assign Replication Manager roles. It is a good idea to create two Administrator accounts, one for day-to-day administration tasks, and the other in case the first account password is lost or the account is deleted. Access to these accounts should be limited to a small number of people since the Administrator is the super user for Replication Manager account.

Define a separate user login for every individual who will be using Replication Manager. Multiple logins may share the same role. Separate logins protect the Replication Manager environment from unauthorized use by keeping the login information to the person who owns the login, therefore:

- Objects, such as ApplicationSets, Jobs, Replicas, and Schedules created by a user can only be accessed by the user unless another user is specifically granted access by the user or the Administrator. An Operator role cannot own an object because the operator cannot define ApplicationSets and Jobs. Operators can be granted access to objects by the Administrator or Database Administrator.
- Other objects can be shared. Examples include hosts and storage. All users, except the operator, have access to hosts and storage unless specifically excluded by the owner.
- Secure mode requires users to enter valid user credentials in order to perform the secure operations (listed below) with that client. If you start the client in Secure Client Mode, Replication Manager asks for a domain name, user name, and password in order to:
 - Run Pre-Replication
 - Post-Replication Script
 - Mount an Oracle database
 - Select a program to run on the mount host
 - Select a backup program to run on the mount host



In summary, this is how the storage process configuration sequence occurs:

Right-click a storage array node to configure a storage array. Configure arrays when:

- You discover a new array
- Array information changes (for example, if you apply a new password)

Right-click a storage array node to discover storage on a storage array.

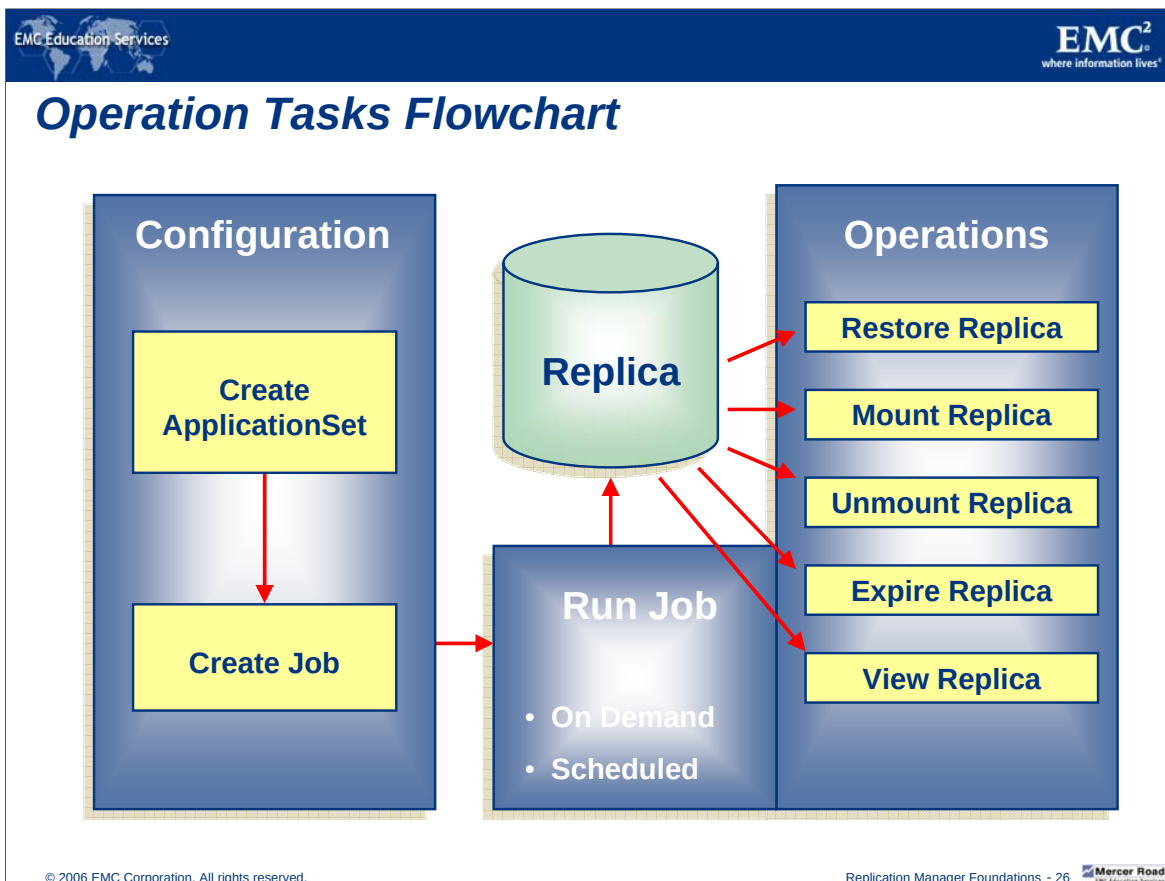
- Execute manual storage discovery when storage changes occur
- Automatic storage discovery occurs daily

Right-click a storage array node to include storage on a storage array

- Storage must be manually included if the Storage Eligibility checkbox is left blank on installation

Right-click a storage array node to assign storage to a Storage Pool

- The Storage Pool must be created first
- You can no longer create a Storage Pool through the Assign Storage menu option



Replication Manager operations include replication configuration and replica-related operations. Before a replication Job can be run, you define an ApplicationSet then create an Job.

The information decisions made during Define New ApplicationSet are:

- What to replicate (Unix and NTFS filesystems, Oracle, SQL, Exchange, and UDB databases)
- Name and description of the ApplicationSet
- Production host name
- Which users have access to the ApplicationSet

The process decisions made during Create Job are:

- How long to keep the replica
- How to manage the application during the replication process (Offline/Online)
- What pre and post replication scripts to run
- What storage to use, if necessary
- What to do with the replica after it is completed (mount, run a backup)

The next step is to run the Job to create the replica. Replicas can be scheduled or run on demand. After the replica is created, you can perform any of the tasks listed in the Operations Box.

Lesson 3 – Replication Manager-SE

Upon completion of this lesson, you will be able to:

- Describe the key features and functionality of RMSE
- Explain the basic architecture of RMSE

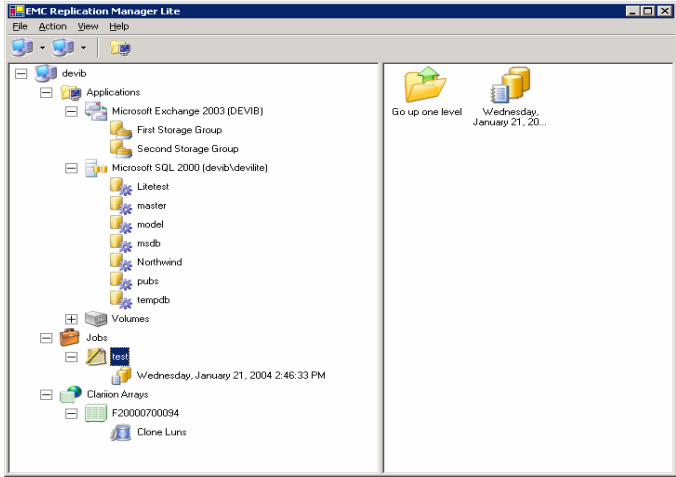
The objectives for this lesson are shown here. Please take a moment to read them.

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What is RMSE?

- Creates disk replicas of mission-critical information for customers running Windows on EMC CLARiiON storage arrays
- Designed for the commercial customer space
 - Customer installable
 - Easy to use



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Replication Manager SE is designed by EMC with the objective of easily creating point-in-time, disk-based replicas of databases and/or file systems residing on CLARiiON storage arrays within a windows 2000 and or Windows 2003 environment. RMSE can create replicas for applications such as Microsoft SQL Server databases, Microsoft Exchange databases, and NTFS volumes - as long as the information is stored on EMC CLARiiON storage arrays.

With RMSE, you can create point-in-time replicas of production data in seconds. These replicas can exist on the same array as the production data, or on a remote array using SAN Copy. Another important feature is the facilitation of quick, frequent, and non-disruptive backups from replicas. RMSE also allows you to mount replicas to alternate hosts to facilitate offline processing, or mount multiple replicas on the same mount host. Finally, RMSE allows you to restore deleted or damaged information quickly and easily from a disk replica, as well as set the maximum number of replicas for replication jobs so that replication storage is made available automatically.

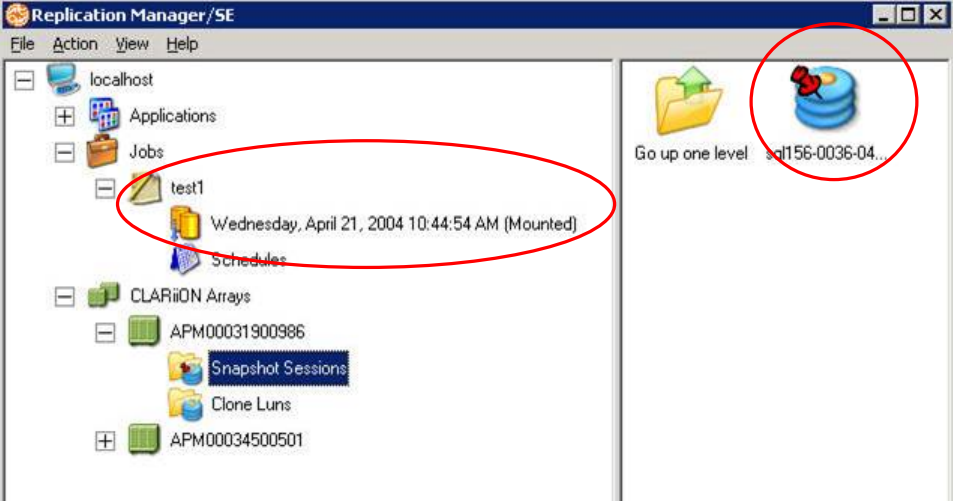
The advantage that RMSE offers is that it automatically controls the complexities associated with creating, mounting, restoring, and expiring data replicas. RMSE Explorer offers an easy-to-use interface to help you manage and control these replicas.

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Functionality

- RMSE provides replication jobs to designate the production data to be replicated



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Replication Manager SE provides replication jobs to designate the production data to be replicated, and defines the associated replication actions to be performed on this data. For each job, you can define a unique replication process and specify how to handle the production data before and after replication. You can also select the storage that may be used for the replica, and then manipulate the replica after it has been created. RMSE also allows you to automatically expire the replica after the maximum number of replicas for that job has been exceeded.

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Functionality (continued)

- Schedule replication jobs to run on a regular basis

The screenshot shows the Replication Manager/SE application window. In the left pane, under 'localhost', there is a 'Jobs' folder. A context menu is open over a job, with the 'Schedule' option highlighted by a red circle. A large red arrow points from this 'Schedule' option to the 'Schedule Job' dialog box on the right. The dialog box has the following sections:

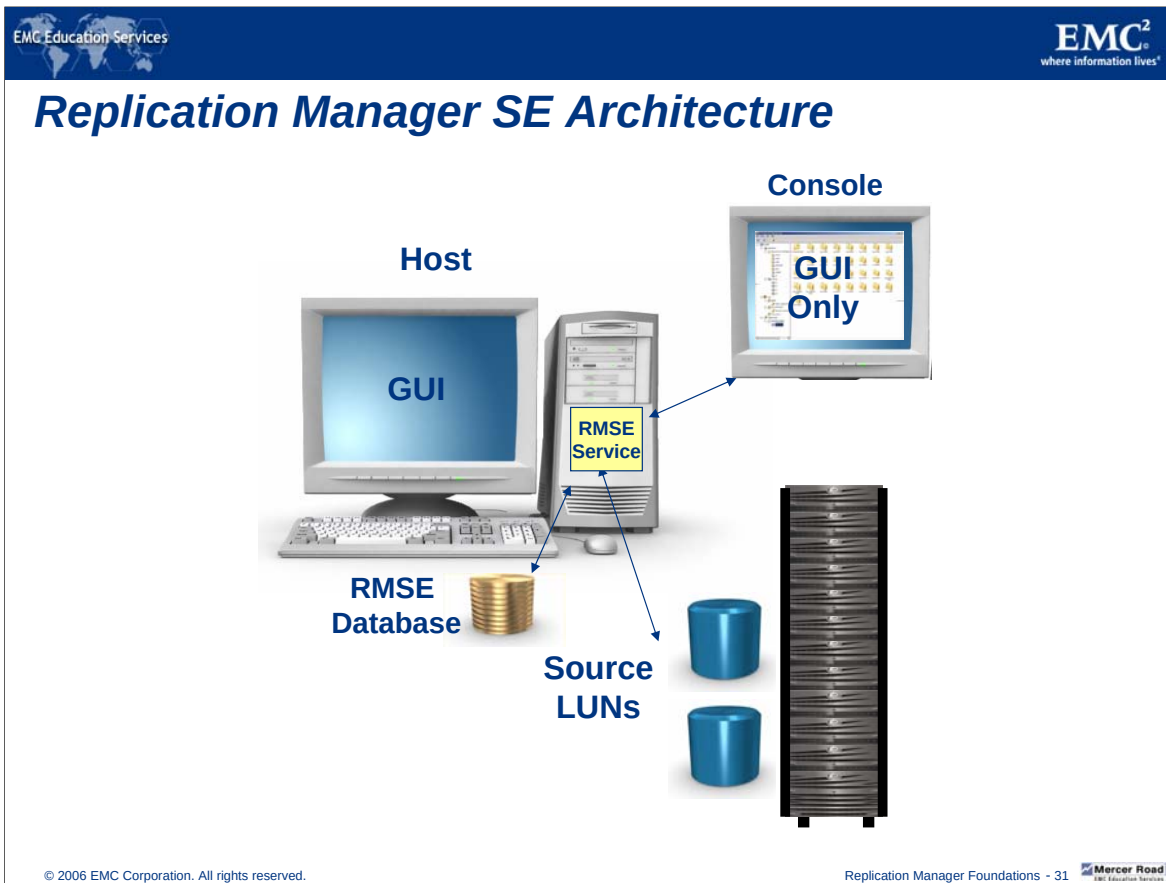
- Daily frequency:** Radio buttons for 'Occurs once at' (9:35:00 AM) and 'Occurs every' (1 hour). 'Starting at' is 9:35:00 AM and 'Ending at' is 10:36:00 AM.
- Recurrence pattern:** Radio buttons for 'Once', 'Daily', 'Weekly', and 'Monthly'. Under 'Weekly', checkboxes for Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday are all checked.
- Range of recurrence:** 'Start' is Wed 7/20/2005 and 'End by' is Tue 9/7/2010. There is a 'No end date' checkbox.
- Run job:** A calendar view for July 2005. The 19th is highlighted.
- User name:** A text field.
- Password:** A text field.
- Buttons:** 'OK' and 'Cancel'.

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RMSE's functionality also allows you to schedule replication jobs to run on a regular basis. Alternately, you can start a replication job on demand. These replication jobs cause only minimal (if any) interruption to the information systems that manage the production data.

There are several reasons to use RMSE to create replicas of production data. These include using the replicas as a source for data backups, using them for decision-support processing, and for data protection, as a source for restore.

Users also have the ability to define pre- and post-replication scripts to perform user-specified actions prior to replication, and after the replication completes.

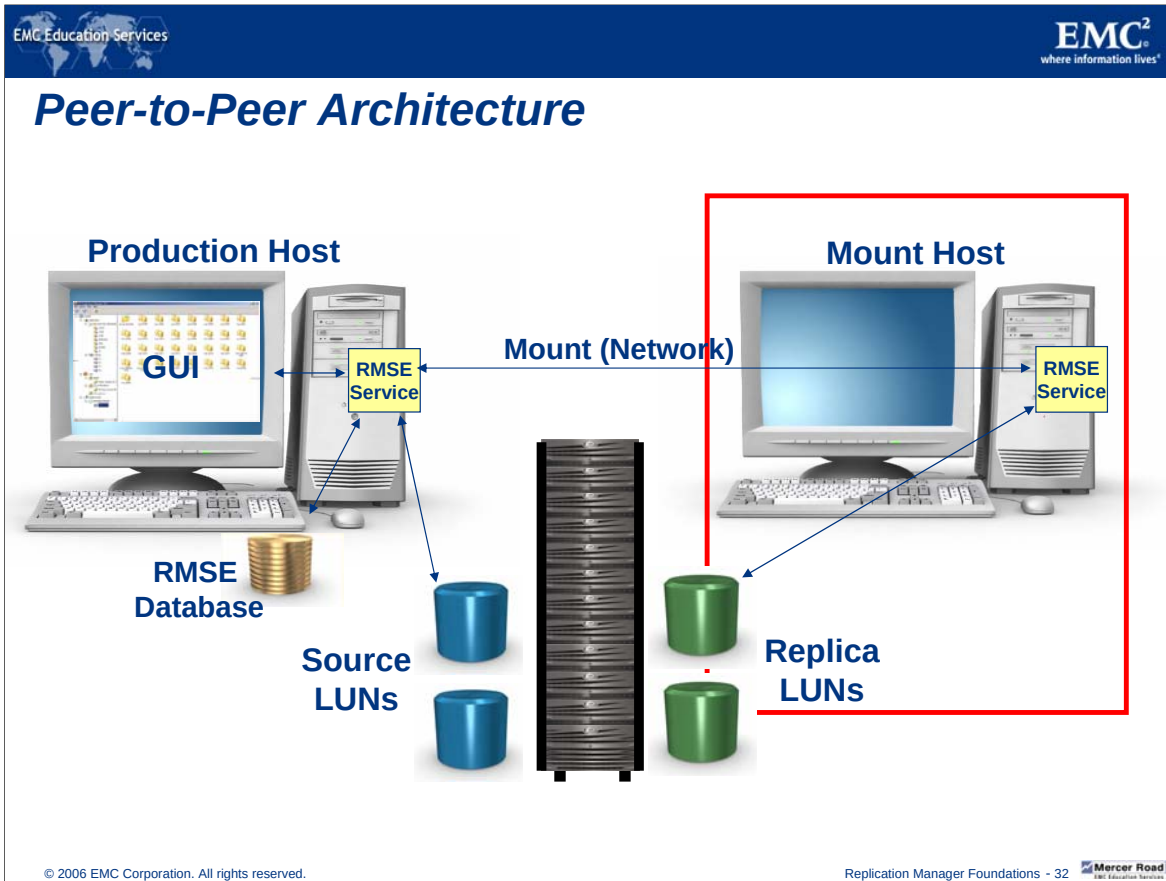


Replication Manager SE utilizes a peer-to-peer architecture, with no additional resource needed for a server component. The graphic shows the components that make up the Replication Manager SE application.

The first component is the RMSE Service, which is installed on the host as a part of the installation.

The second component is the RMSE database, responsible for storing information about replication jobs, replicas, and the storage they use. This is also a part of the install.

The Graphical User Interface can be installed on the same host or on a separate Windows machine as a console. The RMSE User Interface is only supported, however, on Windows 2000 Professional, Server, Advanced Server, and Datacenter Editions; Windows 2003 Server Standard, Enterprise, and Datacenter Editions; or Windows XP.



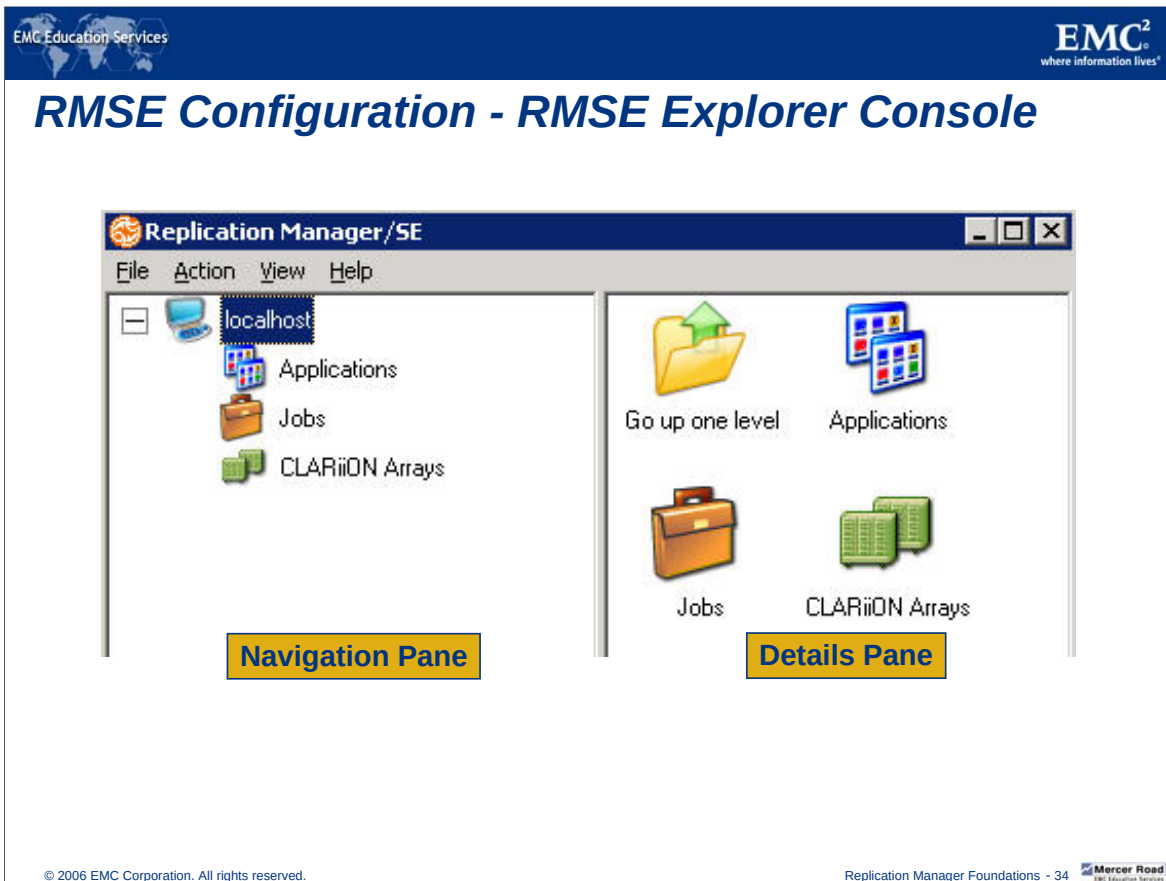
In this peer-to-peer model, all components are also installed on the mount host. The mount host Graphical User Interface and Database may not be used unless a separate replication is being performed from the mount host to another mount host.

RMSE Prerequisites

- **Host software prerequisites**
 - SnapView Admsnap 2.9.x
 - Navisphere Host Agent 6.19
 - Navisphere CLI 6.19 (requires Java 1.4.2_06)
 - PowerPath 4.3, 4.3.1, 4.4, 4.4.1, 4.5
 - Solutions Enabler 6.0.3 or 6.2
- **CLARiiON array prerequisites**
 - Navisphere Agent
 - SnapView
 - Access Logix enabled
 - SAN Copy (if used)

RMSE has several application dependencies, such as Solutions Enabler, PowerPath, Navisphere Agent, NaviCLI, Java Runtime Environment, Admsnap, and, in order to support dynamic disks, Veritas Volume Manager is also required. On Windows 2000, the .NET Framework version 1.1 is required for RMSE Explorer to function properly, which the RMSE installation wizard checks for, and installs if necessary.

RMSE also has hardware requirements such as one or more of the supported CLARiiON storage arrays, LAN connectivity between the components, and Fibre connectivity between the RMSE hosts and the CLARiiON storage array, whether direct connect or through switched fibre connections. With array hardware requirements also comes array software prerequisites such as Navisphere Agent, SnapView, and Access Logix enabled, and SAN Copy, if it is to be used. For the latest requirement listings and specific versions, please see the EMC support matrix.



When the console is first opened, the navigation pane displays the containers that house your manageable objects. The top-level object in this navigation pane is the RMSE Server, which contains all manageable objects - the applications, jobs, and arrays. In most cases, the name appears as “localhost”. If Microsoft Cluster Server is used, the name will appear as the virtual server name of the cluster. You can expand folders through these groups and their data to display details about individual objects. This will allow you to reveal successive levels of detail and additional manageable objects.

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RMSE Application Support Matrix

	Windows 2000	Windows 2003
SQL Server 2000	Supported	Supported
SQL Server 2005	Supported	Supported
Exchange 2000	Supported	Not Available
Exchange 2003	Supported	Supported

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Replication Manager SE supports the following database applications for replication: Exchange 5.5, Exchange 2000, Exchange 2003, and SQL Server 2000. Replication Manager SE can mount replicas on an alternate mount host, as well as back to the production host, and restore from replicas created using Snaps and Clones. As always, for the most up-to-date information, check the support matrix.

Module Summary

Key points covered in this module:

- Replication Manager Family Features
- Architecture
 - Replication Manager
 - Replication Manager SE
- Support Matrix by Version

These are the key points covered in this module. Please take a moment to review them.