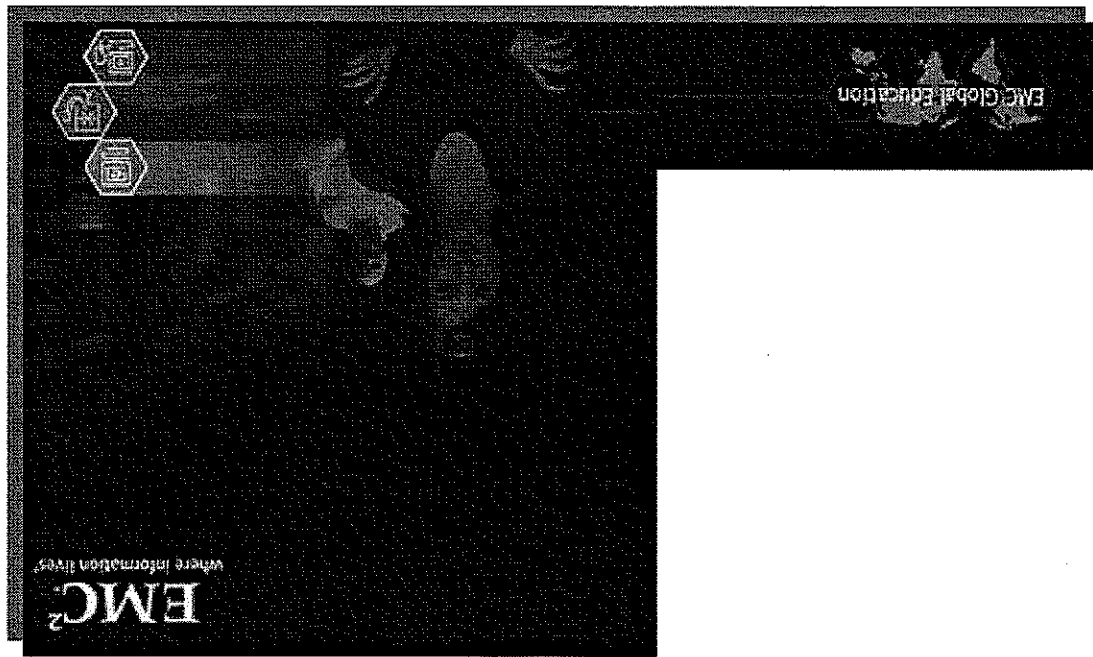


**Symmetrix Business Continuity -
Timefinder Solutions
Student Guide**

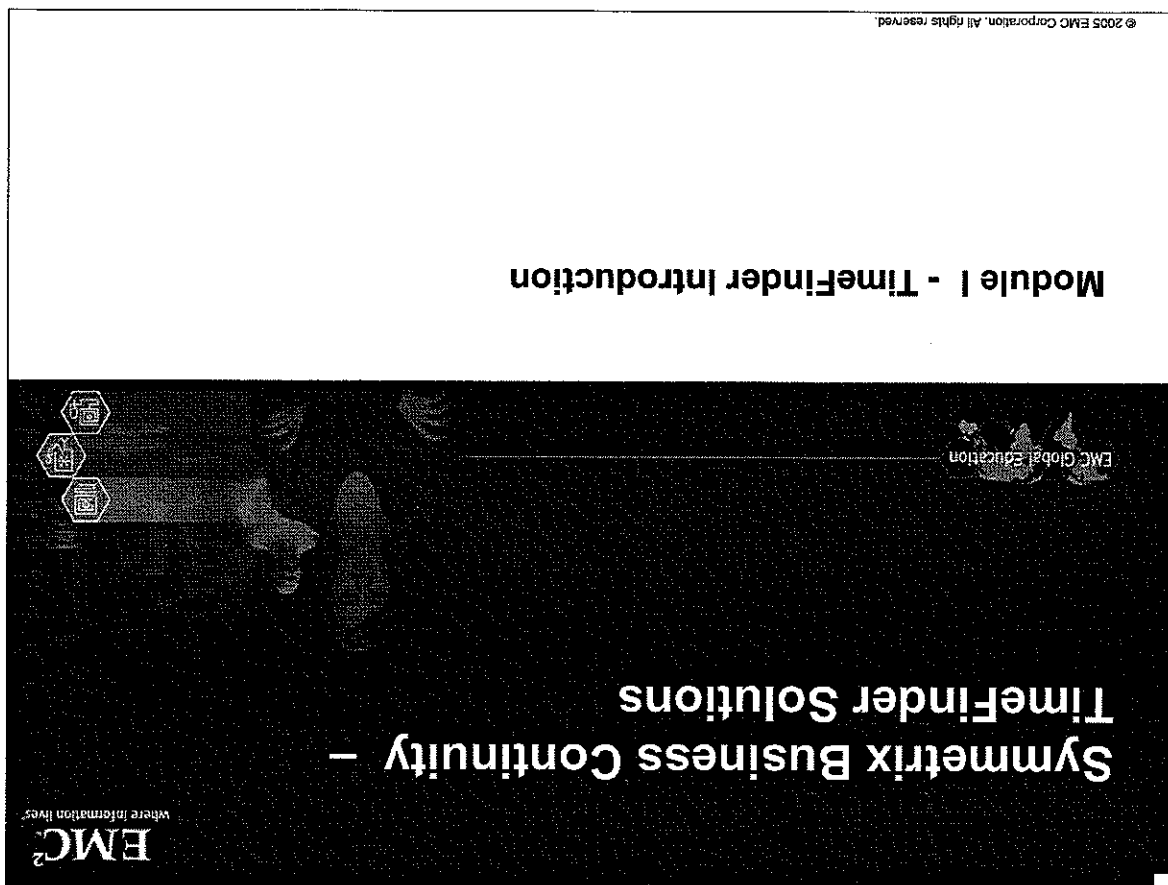
Symmetrix Business Continuity – TimeFinder Solutions

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Date - 12-Sep-2005

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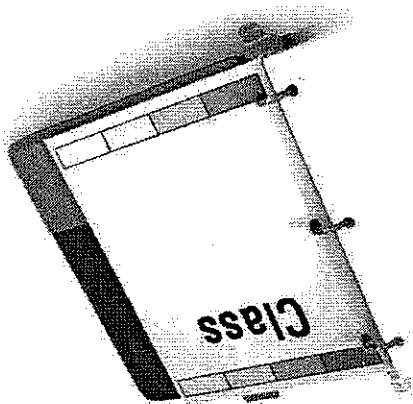
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Rev #	File Name	Date	Revision Number Activity - Notes
1.0a	BCL_Mod1_V10a.Ppt	20-May-2005	First Pass – 20-May-2005
1.2a	BCL_Mod1_V12a.Ppt	26-Jul-2005	Second Pass – After T3 – 26-May-2005
2.1a	BCL_Mod1_V21.Ppt	12-Sep-2005	Name Change
		Module #	Module Name
	***	1	TimeFinder Introduction
		2	TimeFinder Mirror Overview
		3	TimeFinder Mirror Operations
		4	TimeFinder Clone / Operations
		5	TimeFinder Snap / Operations
		6	TimeFinder Labs

Revision History
Symmetrix Business Continuity – TimeFinder Solutions
Module 1 – (TimeFinder Introduction)



Symmetrix Business Continuity – TimeFinder Solutions
Program Administration



- Attendance roster
- Restrooms
- Telephones / Etiquette
- Attendance Rules
- Fire / Evacuation Procedures
- Cafeteria
- Labs
- Local Sites of Interest
- Class Evaluations

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TimeFinder Intro – Mod 1 – Page 3

Discuss the following – for the “site” this program is being offered

- Attendance roster
- Restrooms
- Telephones / Etiquette
- Attendance Rules
- Fire / Evacuation Procedures
- Cafeteria
- Labs
- Local Sites of Interest
- Class Evaluations



Program Objectives

Symmetrix Business Continuity – TimeFinder Solutions

At the completion of this program, the student will be able to

- Describe TimeFinder theory of operations.
- Describe TimeFinder functionality and its use within an IT environment.
- Use SYMCLI to perform TimeFinder operations.
- Describe TimeFinder host considerations and configurations within a Sun Solaris, HP-UX, AIX and Windows environments.
- Use SYMCLI to perform TimeFinder Mirror, TimeFinder Clone and TimeFinder Snap operations.
- Describe EMC Consistency Technology.

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TimeFinder Intro – Mod 1 – Page 4



The above objectives are covered in this program

Program – Symmetrix Business Continuity – TimeFinder Solutions.

Module Name – TimeFinder Local Introduction.

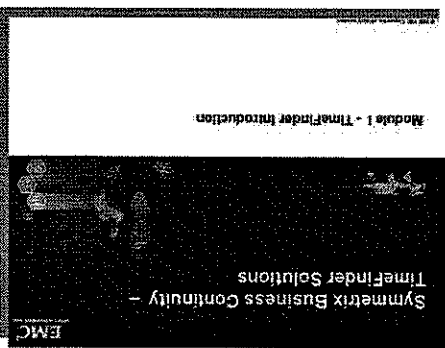
Module Number - I



Symmetrix Business Continuity TimeFinder Solutions
Documentation

The "Manual" contains all the PowerPoint presentations and the student labs.

- Module 1 – TimeFinder Local Introduction
- Module 2 – TimeFinder Mirror Overview
- Module 3 – TimeFinder Mirror Operations
- Module 4 – TimeFinder Clone / Operations
- Module 5 – TimeFinder Snap / Operations
- Labs – TimeFinder Labs
- Apx 1 – BCL Command Lookup Guide



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TimeFinder Intro - Mod 1 - Page 5

Reference the BCL "Read Me" file (A_ReadMe_BLL.Txt) for a complete list of all documentation supporting this program.

Note - - "This material is for training purposes only."

Symmetrix Business Continuity – TimeFinder Solutions

Day One - Time		Activity	
9:00	- 10:30	Module 1 - Introduction Business Continence Local	
10:30	- 10:45	Break	
10:45	- 12:00	Module 2 - TimeFinder Mirror Overview.	
Lunch			
1:00	- 2:30	Module 3 - TimeFinder Operations, Presentation	
2:30	- 3:30	Break	
3:30	- 4:30	Lab 1 - TimeFinder Setup Lab	
4:30	- 5:00	Lab 2 - LVM / TimeFinder Integration Lab	
Day Two - Time		Activity	
9:00	- 9:30	Review (Day One)	
9:30	- 10:30	Module 4 - TimeFinder Clone/Operation Presentation.	
10:30	- 10:45	Break	
10:45	- 12:00	Lab 3 - TimeFinder Clone Lab	
Lunch			
1:00	- 2:30	Module 5 TimeFinder Snap/Operation Presentation.	
2:30	- 2:45	Break	
2:45	- 4:00	Lab 4 - TimeFinder Snap Lab	
4:00	- 5:00	Open - Lab	

Day One, Two - Review / Discuss the above time line which supports the BCL (Business Continence Local) program.



Symmetrix Business Continuity Software Environment

The following Software Environment has been
Established for each student.

- Sun Solaris 5.8 OS
 - OS Recommended Patches.
 - J2SE Cluster Patch.
 - Veritas Vol Manager (VxVM - Ver-4.0)
- HPux 11.00 with 2004 patch bundle
 - HP-LVM
- AIX - 5.2 / ML03
 - AIX-LVM
- W2K
- EMC Solutions Enabler 6.0
- Enginuity Code 5671
- Custom Shell Scripts

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TimeFinder Intro - Mod 1 - Page 7



The above software environment supports the BCL (Business Continuance Local) program. Appendix I is a "Command Quick Reference Guide", supporting this training program. It should be noted here that all students attending this program should have a good understanding of the following:

- Unix file systems.
- A general understanding of a Unix Volume Manager.
- EMC Solutions Enabler
- Symm 5 / Symm 6 overview.

What is Business Continuity?

- Business Continuity is the preparation for, response to, and recovery from an application outage that adversely affects business operations
- Business Continuity Solutions addresses systems unavailability, degraded application performance, or unacceptable recovery strategies

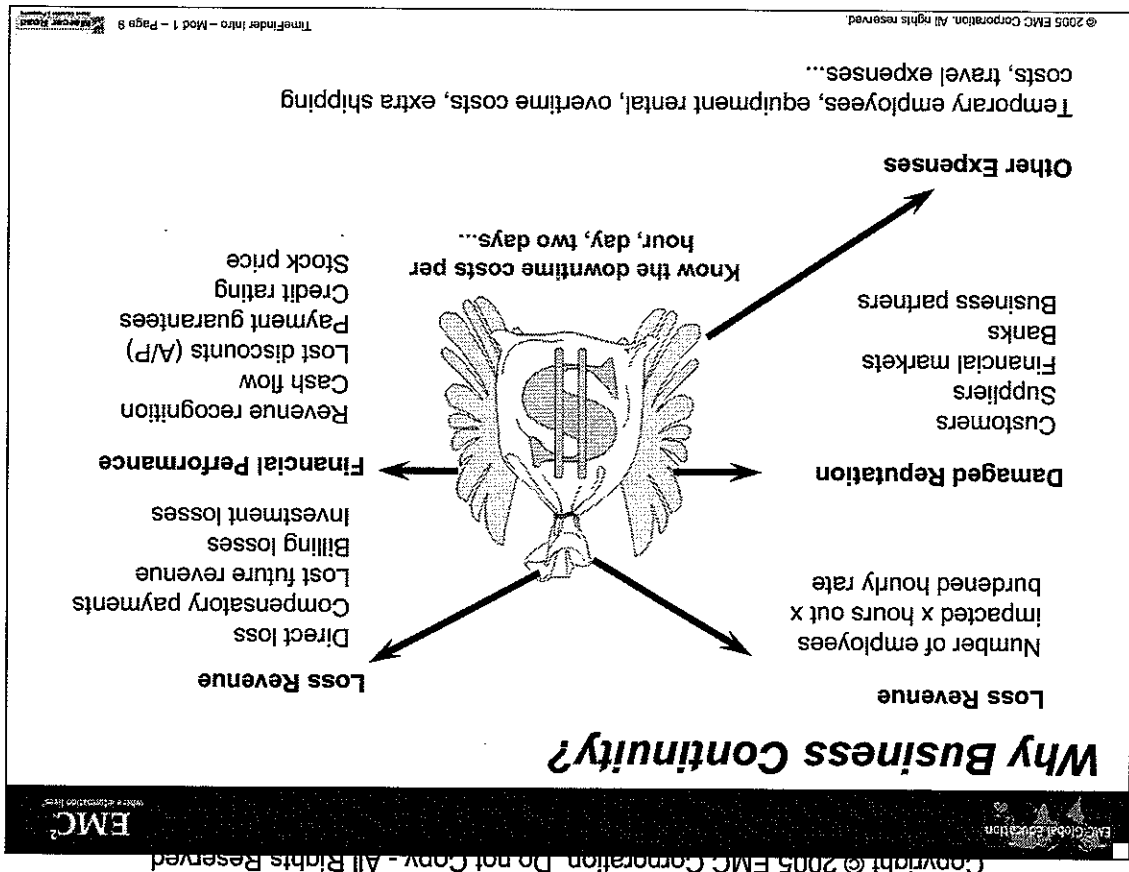
Business Continuity remains at the top of every executive's priority list. Yet executives find themselves in a financial tug-of-war between business continuity solutions and other projects competing for the limited resources. Fundamental to business continuity is the need to understand an organization's practices relative to the protection, availability, and usability of data.

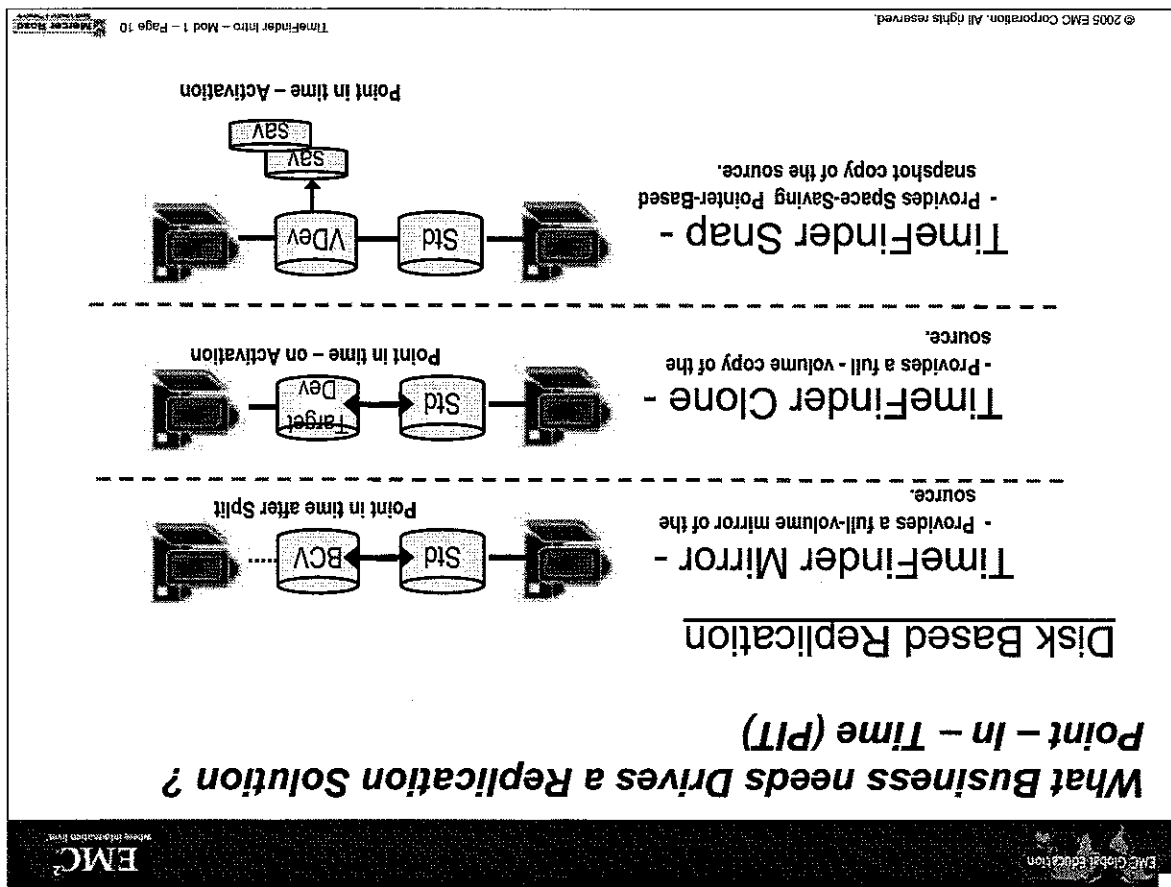
Failures happen - Hardware, Software, Nature Disasters etc. Downtime has a significant impact, the cost is more then just financial loss. What can we do to avoid downtime or minimize the length of time we are down? EMC offers Business Continuity Solutions that help address common failures or outages.

Host to Storage failures and Performance bottleneck of a Host Bus Adapter - PowerPath

Local Storage Protection-TimeFinder Family of Products

Remote Storage Protection and Site Protection - SRDF Family of Products





Providing Choice and Flexibility for Local Replication. Customers are demanding choice and flexibility when building local replication solutions in order to match the right product to their service-level requirements. EMC offers a broad choice of alternatives—from full-volume mirrors and clone copies to space-saving snapshot copies.

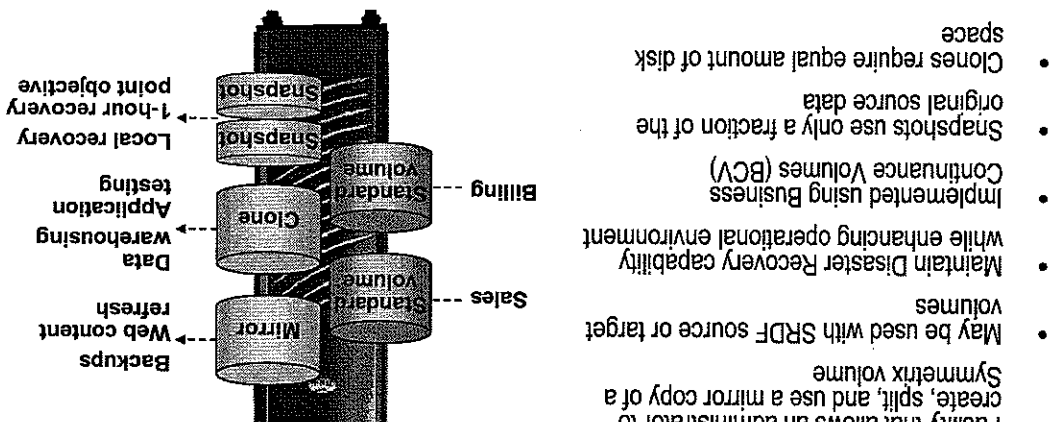
TimeFinder/Mirror (formerly called TimeFinder) has been the industry-leading local replication product since it was first announced in 1997. It is the only local replication product available—high-end or mid-tier—that creates true mirror images of its source; all other products use point-in-time clone or snap technology. Because TimeFinder/Mirror business continuance volumes (BCVs) are full physical copies and appear as a mirror of the standard device, they can be used to increase availability by servicing I/O if the source volume and the source volume's protection are destroyed. Protected TimeFinder/Mirror BCVs provide the highest level of data

TimeFinder/Clone TimeFinder/Clone is the newest addition to the TimeFinder product family. Originally released as a feature of TimeFinder in Enginuity™ 5x68, the new TimeFinder/Clone product has received a significant number of enhancements in the latest release of Enginuity 5671. These include incremental update and restore, increased copy performance (from the original introduction of clone copies as part of TimeFinder/Mirror), and a TimeFinder/Mirror emulation mode for open-systems environments. TimeFinder/Clone provides significant configuration flexibility because clone copies do not use Symmetrix mirror positions, the clone copies may be RAID 5 protected.

TimeFinder/Snap TimeFinder/Snap (formerly EMC Snap) is the only space-saving snapshot copy product available in the high-end. TimeFinder/Snap is different from TimeFinder/Clone and TimeFinder/Mirror as it does not actually create a full copy of the source data. The benefit to customers is that they only need to allocate a small percentage of additional capacity to support changes to the source volume. Of course, since it is not a full copy of the data (TimeFinder/Snap creates pointers back to the production data), if the source data goes away, the snap copy is not usable for a restore process.

EMC TimeFinder family of products allows companies to make more effective use of their most valuable resource, information, by enabling parallel information access. Instead of traditional sequential information access that force applications to queue for information access, TimeFinder allows multiple business processes to have concurrent, parallel access to information. TimeFinder allows dynamic full image copies of data with Business Continuance Volumes (BCV), point-in-time copies through Clones, and logical point-in-time views of production information through Snapshots.

What is the TimeFinder Family of Products?



Meeting Local Replication Service Levels



Module Summary

Key points covered in this Module :

- Presented an overview and a timeline of all the modules that will be covered for this program - "Symm Local Replication – TimeFinder Solutions"
- Discussed possible business need for EMC's TimeFinder Mirror, Clone and Snap applications.
- Reviewed EMC's TimeFinder family of products.

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TimeFinder Intro – Mod 1 – Page 12



The following Module Summary / Key Point for SRDF/S (Synchronous)" where presented.



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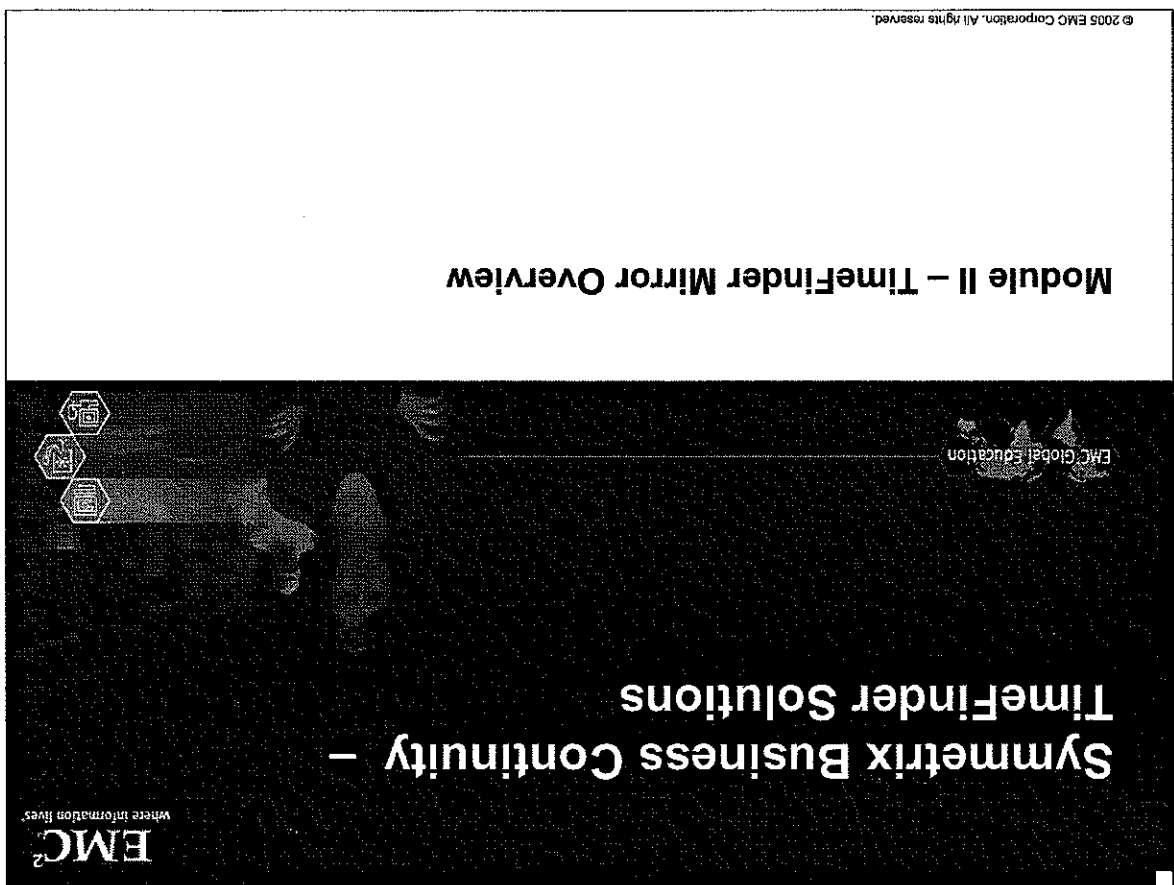
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TimeFinder Intro - Mod 1 - Page 13

This concludes, Module I “TimeFinder Local Introduction” for Symmetrix Business Continuity – TimeFinder Solutions.



The advertisement features a dark background with a grayscale image of a person's face in profile. The text "Symmetrix Business Continuity - TimeFinder Solutions" is prominently displayed in white. The EMC logo is in the bottom left corner, with the tagline "where information lives" above it. In the top right corner, there is a small logo for "EMC Global Education". The title "Module II - TimeFinder Mirror Overview" is centered in the upper half of the ad. At the very bottom, a small copyright notice reads "© 2005 EMC Corporation. All rights reserved."

Symmetrix Business Continuity -
TimeFinder Solutions

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Module II - TimeFinder Mirror Overview

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Rev #	File Name	Date	Revision Number	Activity - Notes
1.0a	BCL_Mod2_V10a.Ppt	30-Mar-2005	First Pass – 30-Mar-2005	
1.2a	BCL_Mod2_V12a.Ppt	26-Jul-2005	Second Pass – After T3 07-Jun-2005	Name Change
2.1a	BCL_Mod2_V21.Ppt	11-Aug-2005		
		Module #	Module Name	
		1	TimeFinder Introduction	
	***	2	TimeFinder Mirror Overview	
		3	TimeFinder Mirror Operations	
		4	TimeFinder Clone / Operations	
		5	TimeFinder Snap / Operations	
		6	TimeFinder Labs	

Revision History
Symmetric Business Continuity – TimeFinder Solutions
Module II – TimeFinder Mirror Overview



Module Objectives – TimeFinder Overview Symmetrix Business Continuity – TimeFinder Solutions

At the completion of this module, the student will be able to

- Describe EMC TimeFinder functionality and it's uses
- Use SYMCLI to perform TimeFinder operations
- Describe TimeFinder Host considerations and configurations

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Mod 2 – Page 3



The above objectives are covered in this module

Program – Symmetrix Business Continuity – TimeFinder Solutions.

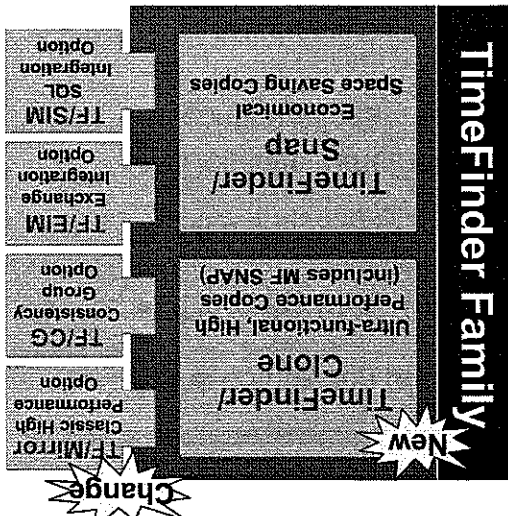
Module Name – TimeFinder Overview)

Module Number - II



New TimeFinder Family Products

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- TimeFinder/Clone Base Product
 - New standard for full-copy BCVs
 - Formerly part of TimeFinder/Mirror
 - MF SNAP Facility included
- TimeFinder/Mirror becomes add-on option
 - TimeFinder/Mirror recommended for ultra high performance and availability requirements
- Existing TimeFinder/Mirror customers "grandfathered"
 - If on maintenance, will continue to receive TimeFinder/Mirror and TimeFinder/Clone (including MF SNAP)

SE 6.0 TimeFinder/Clone enhancements effectively give Clones the same functionality as TimeFinder/Mirror, therefore all preexisting symmrit scripts can execute now using symclone under the covers. For new customers, TimeFinder/Mirror becomes an add-on product.

Meeting Local Replication Service Levels

- Facility that allows an administrator to create, split, and use a mirror copy of a Symmetrix volume
- Additional copy within same Symmetrix volume
- May be used with SRDF source or target volumes
- Maintain Disaster Recovery capability while enhancing operational environment
- Implemented using Business Continuity Volumes (BCV)
- Snapshots use only a fraction of the original source data
- Clones require equal amount of disk space

TimeFinder

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Mod 2 - Page 5

The EMC TimeFinder family of products allows companies to make more effective use of their most valuable resource information by enabling parallel information access. Instead of traditional sequential information access that force applications to queue for information access, TimeFinder allows multiple business processes to have concurrent, parallel access to information. TimeFinder allows dynamic, full image copies of data with Business Continuity Volumes (BCV), point-in-time copies through Clones, and logical point-in-time views of production information through Snapshots.

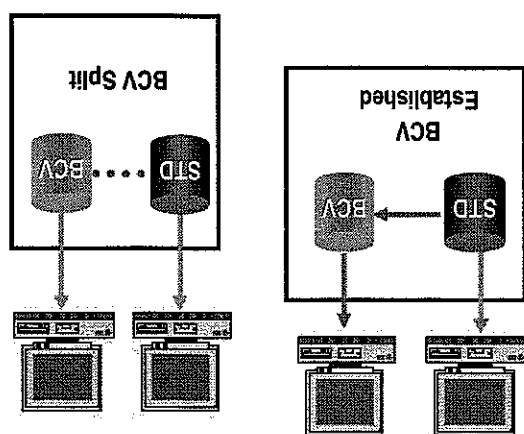
TimeFinder allows companies to make more effective use of their most valuable resources by enabling parallel information access as opposed to traditional sequential information access, thus eliminating the need to do things like quiesce an application for backups.

BCV and standard devices should be configured on opposing Front End and Back End Directors for redundant paths.

TimeFinder Business Continuance is possible due to Business Continuance Volume (BCV) devices. These BCV devices are standard Symmetrix devices that are specially configured to be dynamic mirrors. Each BCV device has its own host address and is configured as a stand-alone device.

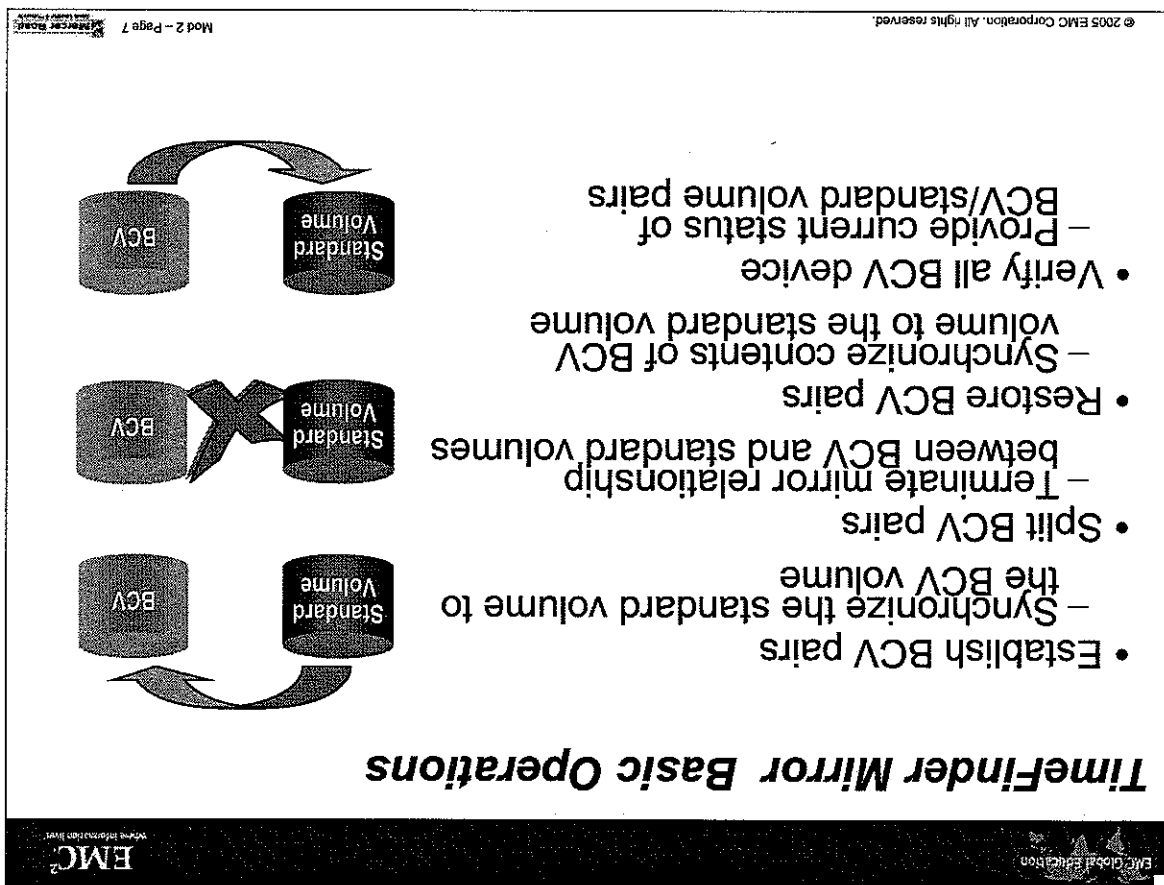
EMC ControlCenter provides an interface to control the use of BCV devices that already exist in the Symmetrix configuration. Configuring Symmetrix units as BCV devices is done by the Customer Service Engineer during installation, or by the customer with Symmetrix Manager ECC software.

EMC TimeFinder Business Continuance Volume (BCV)



- Uses Business Continuance Volume (BCV) to create an additional mirror image of a standard device
 - Can be dynamically and non-disruptively **established** and synchronized
 - Can be **split** instantly to create "point-in-time" copy
- "Point-in-time" copy can address workload compression and maintain continuous business operation
 - Data Protection - Standby data for fast recovery
 - Decision support
 - Backup

1. "Establish" BCV
2. "Query" BCV status until completely synchronized
3. "Split" BCV
4. Execute BC operations using BCV

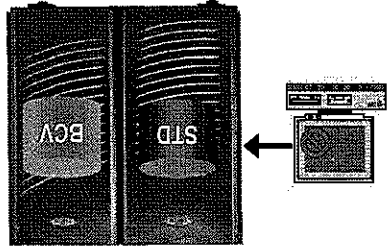


TimeFinder allows the user to create several host-based business continuity operations and control these operations through host commands. The user can establish a BCV, then split it to make the BCV available to a host/server. After completing the business continuity processes on the BCV device, the user can re-establish the BCV pair. Typical BCV operations include establish, split, re-establish, restore, incrementally restore, and verify.

Consistent Split - PowerPath and ECA

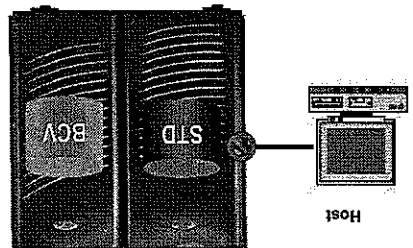
PowerPath split

symmtr -instant -ppath
symmtr -instant -rdb



- PowerPath holds I/O during split
- Read and write I/O
- Executed from host doing I/O
- Affects only one host
- Does not require independent access to a gatekeeper

Enginuity Consistent Assist Split symmtr -consistent



- Symmetrix holds I/O during split
- Write I/O (subsequent reads after first write)
- Executed by any Symmetrix-attached host
- Multiple host support
- Requires independent access to a gatekeeper

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Performs an Instant Split across a group of devices using a single Consistent Split command, thus all the BCVs in the group are consistent point-in-time copies. Used to create a consistent point-in-time copy of an entire system, an entire database, or any associated set of volumes. Can create consistent splits on remote BCVs through SRDF.

PowerPath-based consistent split executed by the host doing the I/O:

- -rdb option
- -ppath option

I/O is held at the host before the split.

ECA-based consistent split can be executed:

- By the host doing the I/O as long as there is a dedicated path for a gatekeeper to perform the control
- By a control host (no database) in an environment where there are distributed and/or related databases
- -cons option

I/O held at the Symmetrix until the instant split operation is completed:

- Approximately 3 seconds.

Available on Solaris, HP-UX, AIX, Tru64, and W2K platforms

Since I/O is held at the Symmetrix, ECA can be used to perform consistent splits on BCV pairs across multiple, heterogeneous hosts.



TimeFinder/Mirror: Consistent Split

- Three methods to execute Consistent Split
 - By specifying **-ppath** and PowerPath STD devices that hold the database
 - Specific devices – supply the device name
 - All devices using keyword **STDDEVS**
 - Use **-rdb** for automatic mapping of DB devices
 - By specifying **-consistent**
 - By specifying **-vxfs** for VxFS filesystem (Solaris and HP only)

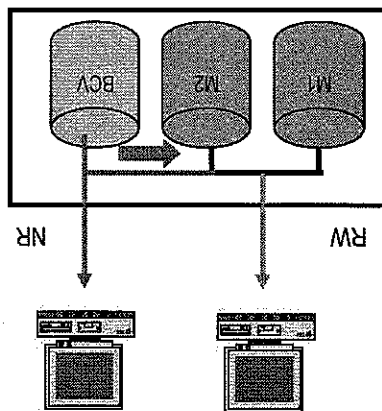
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There are three types of consistent activation available; each offers a restartable copy on the BCV devices:

- PowerPath
- ECA
- Veritas File System

TimeFinder Restore

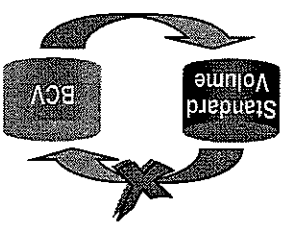
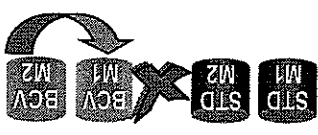
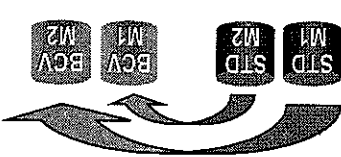
- During a symmtr restore operation, data on the standard is replaced with data from the BCV volume.
- Primary host still has full read/write access to the standard volume.
- If an application is using the standard volume during a restore, the results would be unpredictable.
- Applications must be stopped, file systems unmounted, and volume groups deactivated when a restore is initiated.



Remember that "restore" is a recovery operation. So applications should be stopped, files systems unmounted, and VG deactivated before you issue the restore command.

TimeFinder Extended Operations

- Protected BCV Restore - Restore a BCV to a STD but do not propagate STD writes to the BCV
 - Used to retain original BCV data after the restore process
- Reverse Split - By specifying a reverse split, data can be moved (full or differential) from the M2 mirror of the BCV to it's M1 mirror
- Protected BCV Establish - Moves all mirrors of locally mirrored BCV so all mirrors are instantly synchronized

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The extended BCV operations include protect establish, reverse split, and protected restore. These operations add flexibility to TimeFinder configurations and allow for added protection of gold BCV copies.

Protected BCV Establish

In a 2-way BCV mirror configuration for a normal establish, M2 is fixed and can only be updated from M1 after a split. For a 2-way BCV mirror device for a protected establish, both M1 and M2 move to the standard device mirror set and become instantly synchronized and available for updates from I/O activity on the standard device.

Reverse Split

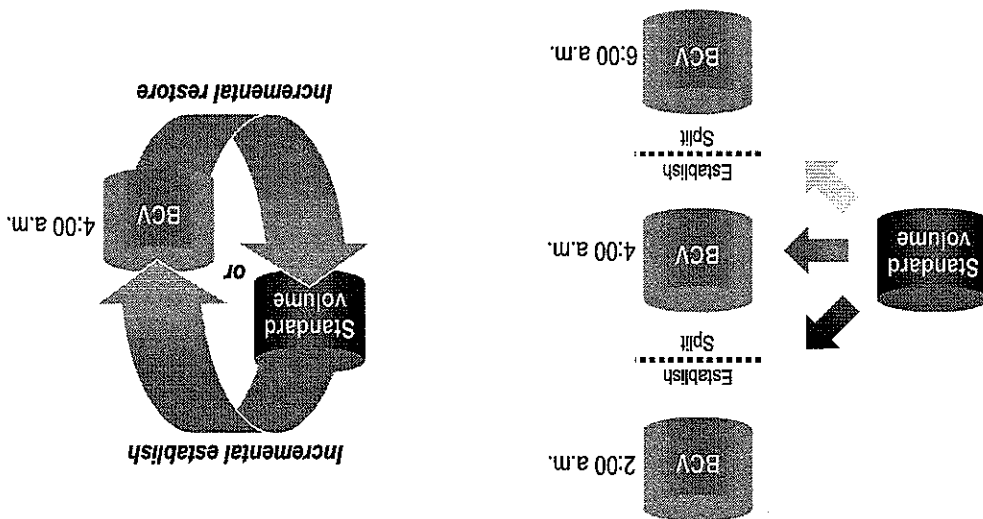
In a reverse split operation, the direction of data flow between the BCV mirrors is reversed. during a reverse split, the fixed BCV mirror (M2) will refresh the moving mirror (M1) after the split operation. This behavior may be desirable when you need to revert to an older copy of the data that was on the BCV before it was established.

Protected Restore

A protected restore feature allows the contents of a BCV to remain unchanged during and after a restore operation, even while the BCV and the standard are joined.

Multi-BCVs

- Standard device keeps track of changes to multiple BCVs one after the other
- Incremental establish or restore – supporting up to eight BCVs



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By default, TimeFinder can “remember” up to eight BCVs.

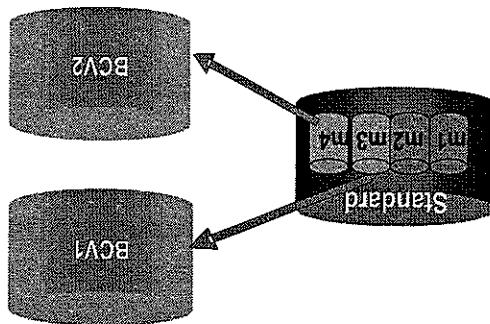
This means that different BCVs can be established and then split from a standard volume at different times of the day. It used to be that the Symmetrix did not keep track tables for the previous BCVs; the track table was only for the last, most recent BCV. Thus, a BCV that was split at 3:00 a.m. could not be re-established if another BCV had been established and split at 4:00 a.m. The 3:00 a.m. BCV would have to be established (full volume copy) again.

With the Multi-BCV function, up to eight BCVs will be remembered by the Symmetrix. In other words, a BCV that was split at 4:00 a.m. can be re-established even though another BCV was established and split at 5:00 a.m. In this way, a user can split and incrementally re-establish volumes throughout the day or night and still keep re-establish times to a minimum.

Incremental information can be retained between a STD device and multiple BCV devices, provided the BCV devices have not been paired with different STD devices.

Concurrent BCVs

- Each BCV will occupy a mirror position - locally protected R1 volumes cannot have two BCVs established with them concurrently.
- Establish two BCVs with the same standard simultaneously or one after the other.
- The BCVs can be split individually or simultaneously.
- *Simultaneous, "Concurrent Restores", are not allowed.*



Concurrent BCVs is a TimeFinder feature that allows two BCVs to be simultaneously attached to a standard volume. The BCV pair can be split, providing customers with two copies of the customer's data. Each BCV can be mounted online and made available for processing.

Split Operations for Concurrent BCVs

- Split operations can be performed against the STD and the BCV1 or BCV2 pairs:

- Simultaneously Split both BCV's
`symm1r -g <DgName> split DEV001`

- Independent Mirror Split
 - To target the split action at only one of the BCV devices, specify the BCV on the command line
 - The other BCV will remain established with the STD

- `symm1r -g <DgName> split DEV001 bcv 1d BCV002`



Querying Concurrent BCV Status

- When concurrent BCVs are part of a device group, use the `-multi` option as part of the query command
- Invalid track tables are maintained - future concurrent incremental establish operations are possible
- To evaluate the background progress after initiating a split operation
`symcli -g <DgName> query -multi -bg`
- To verify the status of concurrent BCV pairs:
`symcli -g <DgName> verify -concurrent`



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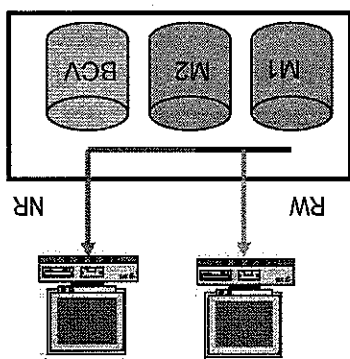
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TimeFinder Host Considerations

- While established, BCV is a mirror to the STD device and is not accessible by the host
- All access to a BCV must be stopped before it is established
- Stop application, unmount filesystem, and deactivate volume group
- Any attempt to access the BCV device while it is established will result in an I/O error
- ing command will hang and timeout
- Activating a volume group or mounting a filesystem that resides on a BCV while the BCV is established will result in an I/O error
- If the host is re-booted or reconfigured while the BCV is established, the BCV will not be detected and may cause it to be removed from the host device configuration

Before a BCV is established to a standard device, it can be accessed by a host as a separate and independent device



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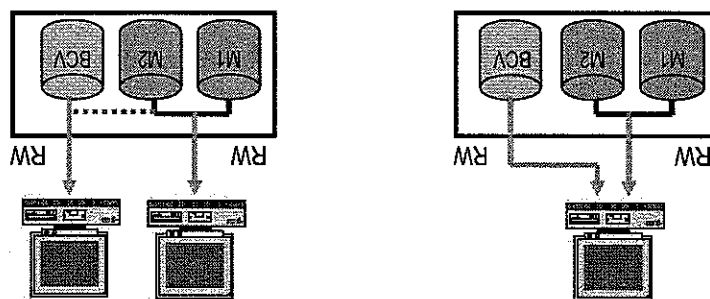
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TimeFinder provides host-transparent, "splittable" mirrors that can be used in a variety of ways to enhance application availability and reliability. On the BCV host side, TimeFinder operations are not transparent. When the BCV is established with the standard volume, it becomes unavailable to the BCV host system. Any attempt to access the BCV will fail.

If the host is re-booted or reconfigured while the BCV is established, the BCV may not be detected and may cause it to be removed from the host device configuration.

AIX addresses established BCV issues by automatically configuring the BCV as a "Defined" device in the AIX ODM. When a reboot occurs, the BCV is not automatically configured. BCV devices that are not established can be configured during reboot with the EMC command mkbcv. BCV devices that are established can be made available with mkbcv after they have been split.

TimeFinder Host Considerations



- When a BCV is split, it can be used by the same host or by a different host
- There are LVM issues when both BCV and Standard device are accessed from same host
 - UNIX Systems – Duplicate Physical Volume Ids and Volume Group Ids
 - Windows 2000 – Duplication of disk signatures and Volume configuration information

Note – Dynamic disk requires a second host.

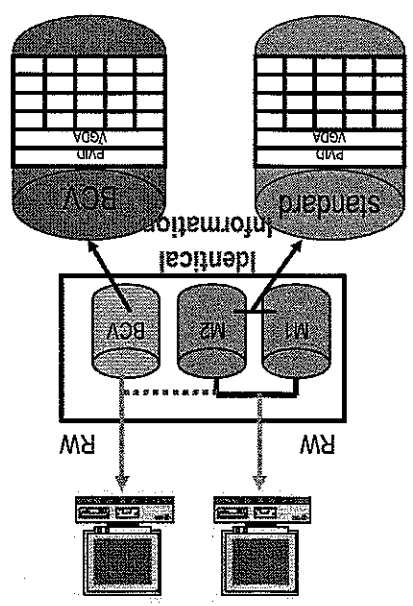
A split BCV is an identical copy of the volume it was dynamically mirrored to. When accessing the BCV on the same host as it's mirror duplicate, volume information must be changed.



TimeFinder Multiple Host Environment

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- When a Standard volume and a BCV is split, a different host can easily access the volume group by "importing" the volume group
- There is no conflict with PVIDs and VGDA information because each host only accesses one copy of the data
- There is also a performance benefit when BC applications use a copy of the data on a non-production host



The diagram illustrates a TimeFinder Multiple Host Environment. At the top, two host icons represent a production host and a non-production host. Each host has a 'PVID' and 'VGDA' section. Below the hosts is a storage array containing three volumes: 'M1', 'M2', and 'BCV'. The 'BCV' volume is connected to both hosts via 'RW' (Read-Write) paths. The 'M1' and 'M2' volumes are connected to the 'BCV' volume via 'RW' paths. The 'BCV' volume is also connected to the 'M1' and 'M2' volumes via 'RW' paths. The 'BCV' volume is labeled 'Identical Information'.

When accessing a BCV on a second host, there are no duplicate Ids to consider. The device can simply be brought online using standard host controls.

The diagram illustrates a TimeFinder Multiple Host Environment. At the top, two host icons represent Host A and Host B. Host A is labeled 'BCV' and Host B is labeled 'standard'. Both hosts have a 'PVID' and 'VGDA' section. Below the hosts is a storage array containing three volumes: M1, M2, and BCV. Host A is connected to the BCV volume, and Host B is connected to the M1 volume. Both connections are labeled 'RW' (Read-Write). A dashed line connects the BCV and M1 volumes, indicating a split operation.

1. symmir establish
2. symmir split
3. Mount the file system Host B
4. Start your application on Host B

TimeFinder Multiple Host Environment

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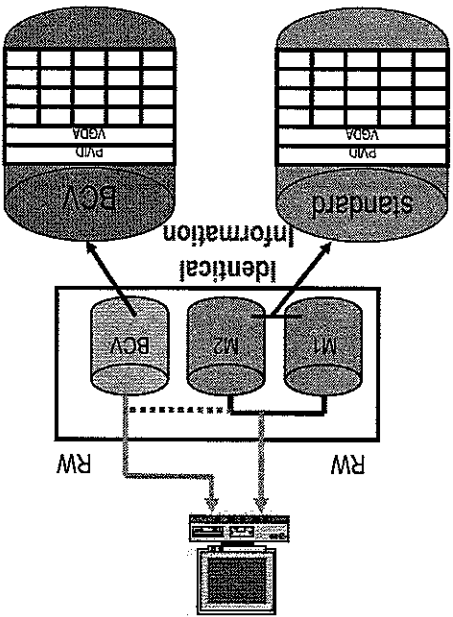
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This slide shows the basic steps for accessing a BCV on a secondary host in a TimeFinder environment. It performs a "clean" split operation which would require no form of recovery from the application when restarted at the secondary host. It does not take into account the use of consistent split that would perform a freeze/thaw on the application to allow for a consistent point-in-time copy of the data at the secondary host, but could require a level of recovery.

TimeFinder Host Considerations – Same Host

- When both the BCV and the standard volumes are accessed by the same host, there is a conflict
- Both the Standard and BCV volumes have identical PVIDs and VGDA information
- Host expects the PVID and VGDA to be unique
- Additional steps must be taken before the host can use both the BCV and the standard device



Accessing a BCV on the same host as the original production data requires addressing duplicate disk identifiers in order to access the device. Each operating system has unique methods for addressing the duplicate identifiers.



Module Summary

Key points covered in this Module :

- Described EMC TimeFinder functionality and it's uses
- Used SYMCL to perform TimeFinder operations
- Described TimeFinder Host considerations and configurations



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The following Module Summary / Key Point for TimeFinder Overview where presented.



where information lives

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This concludes Module II “TimeFinder Overview” for Symmetrix Business Continuity – TimeFinder Solutions.