EMC TimeFinder Product Description Guide
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Chapter 1
Introduction

Overview

Every day system managers see situations where several processes require the same set of data at the same time. They then must confront some hard questions about system availability. Shut down the production system for several hours to produce a backup? When is there sufficient time to load a data warehouse? One Saturday morning every month? And how do developers, testing new applications, get data fresh from today’s operations?

EMC TimeFinder™ software helps you resolve such availability issues. This unique business continuity solution helps win the “race to sunrise” when backups or other administrative procedures must finish before the production system returns to an active state. It lets you compress batch streams, perform more frequent point-in-time backups, and load and refresh data warehouses in a more timely fashion. With EMC TimeFinder, you can test applications with real data, a critical capability when facing adjustments necessitated by European common currency, Year 2000, and other issues.

EMC TimeFinder works by creating multiple, independently addressable online Business Continuance Volumes (BCVs) for information storage. As a standard Symmetrix® device with special attributes, the BCV independently supports host applications and processes.

EMC TimeFinder's unique capabilities help maintain a viable, secure system while ensuring that competing applications receive the data they need. BCVs, created as mirror images of active production volumes, can facilitate running multiple IS tasks in parallel. The principal device remains online for regular Symmetrix operation from the original host/server. Plus, each BCV contains a unique host address and is configured as a single mirror.

The Value of EMC TimeFinder

EMC designs Symmetrix products to help customers enhance business efficiency and improve revenue streams. These advantages typically take any combination of three forms:

1 Business Impact
2 Operational Impact
3 Financial Impact

Business Impact

Business impact translates into increased revenue generation. By enabling backups to be run concurrently with production, EMC TimeFinder can allow you to increase the hours of online processing, thereby increasing the overall revenue that can be generated by your applications.

Operational Impact

Operational impact means continuous data availability and compatibility with existing technology. EMC TimeFinder handles the most challenging applications. By creating a BCV that contains current production data, for example, EMC TimeFinder lets you isolate and test real production data for Year 2000 and European currency conversion issues without impacting overall system performance. EMC TimeFinder lets you avoid downtime costs, protect transactions, and maximize system data availability 24-hours-a-day, seven days a week.

Financial Impact

EMC TimeFinder makes existing operations more efficient by minimizing the downtime required for system backups. Instead of shutting down applications, EMC TimeFinder lets you maintain continuous, concurrent access to production data. It reduces backup-related downtime to a minimum while letting you take advantage of more efficient computer resources.
EMC Enterprise Storage™ systems, solutions, and services derive their industry leadership position from our Intelligent Storage Architecture, ISA and MOSAIC:2000® — a combination of industry-standard software and hardware — achieving unsurpassed levels of information protection, information sharing, and information management. EMC’s Enterprise Storage architecture ensures optimum performance, availability, scalability, and connectivity. Complementary ISA software and MOSAIC:2000 hardware architectures demonstrate the unique storage system philosophy of all EMC Enterprise Storage products, including SRDF, and their capability to share information within an organization.

An EMC Enterprise Storage system:
- Stores and retrieves data from all major computing platforms, including mainframe and open systems environments
- Enables software-based functionality that ensures business continuance even in the event of a disaster
- Delivers rapid and nondisruptive data migration from one system to another
- Shares information, regardless of origin.

**Intelligent Storage Architecture (ISA)**

<table>
<thead>
<tr>
<th>Database</th>
<th>Applications</th>
<th>Management</th>
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<tbody>
<tr>
<td>APIs</td>
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Information Management
Provides graphical user interfaces to make configuration and management of storage activity easy.

Information Protection
Ensuring the highest availability in the event of planned or unplanned information systems interruptions.

Information Sharing
Multihost support allows high-speed movement of large amounts of information between different platforms.

Performance, Availability
MOSAIC:2000
Maintainability, Scalability, Compatibility

EMC’s Intelligent Storage Architecture (ISA), consolidates information sharing, management, and protection into a single intelligent storage system capable of managing the information storage and retrieval needs of the entire enterprise.
EMC Enterprise Storage

**EMC's Architectural Approach**

Symmetrix systems’ architectural approach lets you easily integrate the enhancements that advances in software and hardware technology offer. The basic system infrastructure remains constant when you add or replace other elements. This adaptability allows Symmetrix EMC Enterprise Storage systems to remain on the leading edge of user needs and technology improvements while preserving existing customer information technology investments.

**Information Protection**

EMC software provides a variety of information protection/business continuity options, including extensive RAID (Redundant Array of Independent Disks) data protection, Mirroring (the optimum RAID level for both performance and availability), EMC’s RAID-S enhanced parity protection, and Dynamic Sparing. As a component of the ISA architecture, EMC TimeFinder meets the need for business continuity and solves the problem of competing workloads. In conjunction with SRDF, EMC TimeFinder maintains the system’s disaster recovery capability and increases overall operational efficiency. With the capability to create separate addressable volumes and access current transaction data, EMC TimeFinder allows you to work with fresh data without disrupting the production system.

Other software offerings supplement the EMC Enterprise Storage philosophy.

- **Symmetrix Remote Data Facility (SRDF™)** provides fast enterprise-wide data recovery and business continuity capabilities in the event of an unplanned or planned data center outage.
- **SRDF FarPoint™**, an advanced SRDF capability, significantly increases SRDF performance over extended distances through the optimization of the communication line.
- **EMC CopyPoint™** extends SRDF capabilities to AS/400 environments.
Symmetrix Data Migration Services (SDMS™), enables users to migrate data off older mainframe storage devices or other Symmetrix systems to Symmetrix without stopping business operations during the migration.

You can use EMC’s Remote Support network to upgrade Symmetrix operating software (microcode) on an operational Symmetrix system with minimal interruption of service. This unique approach upgrades Symmetrix software and functionality without downtime, combining fast functional enhancements with continuous data availability.

**Information Sharing**

Symmetrix provides centralized, sharable information storage that supports changing environments and mission-critical applications. This leading-edge technology begins with physical devices shared between heterogeneous operating environments and extends to specialized software that enhances information sharing between disparate platforms.

- Symmetrix provides standard simultaneous multiple open systems support.
- Symmetrix Enterprise Storage Platform (ESP) software provides simultaneous mainframe and open systems support for Symmetrix 3000 and 5000 systems.
- EMC Celerra® File Server combines hardware and software to move data at exceptionally high speed over departmental and enterprise networks for centralized data storage.
- EMC InfoMover™ (the former Symmetrix Multihost Transfer Facility (SMTF)) extends information sharing. InfoMover facilitates high-speed bulk file transfer between heterogeneous host platforms without the need for network resources.
- DataReach™, developed through a partnership between EMC and BMC® Software, Incorporated, uses Symmetrix ESP as an enabling technology to provide access to mainframe database information, extract it, and transfer it to an open systems relational database.

**Information Management**

EMC Enterprise Storage systems improve information management by allowing users to consolidate storage capacity for multiple hosts and servers. EMC offers powerful graphical user interface (GUI)-based tools that dramatically simplify and enhance Symmetrix configuration, performance, and status information gathering and management.

- EMC Data Manager (EDM™) supports open system backup needs from one centrally managed site while offering a complete, high-performance database backup solution for the entire enterprise.
- FDR™ Family of Backup/Restore Solutions, offered as the result of a teaming agreement between EMC and Innovation® Data Processing Corporation, provides a suite of the fastest, least disruptive mainframe-based backup/restore solutions available for mainframe and heterogeneous system environments.
- Symmetrix Manager provides enhanced GUI-based storage monitoring, configuration, and performance tuning management capabilities for Symmetrix systems supporting mainframe and open system environments.
- EMC PowerPath™ offers a simultaneous combination of multiple path access, workload balancing, and path failover capabilities between Symmetrix systems and server hosts.
Chapter 2
EMC TimeFinder Uses and Applications

Overview

Typical EMC TimeFinder uses and applications include:

- Workload Compression
- Data Warehousing and Decision Support
- European Currency Conversion Testing
- Year 2000 Testing
- Backups/"Race to Sunrise"
- Disaster Recovery
- Data Exchange
- Environmental Refresh

Workload Compression

A BCV contains a mirror image of an active production volume so you can run simultaneous tasks in parallel. Parallel processing, or workload compression, promotes efficiency, increases productivity and provides continuous support for enterprise needs.

Typically, IS managers use job-step copies to protect data while an application runs. These copies minimize the need to return to the beginning of a job should a problem occur. With EMC TimeFinder, you can split off copies in seconds as frequently as needed during the processing.

A payroll application, for example, could require data from three different time zones. You can make a copy of the data from the first time zone by establishing a BCV to the production volume, and splitting it off after processing data from the first time zone. Attach another BCV and split it off as a job-step copy containing processed data from the next time zone. Continue with processing for the third time zone. If a faulty data input occurs from the second time zone, you can begin processing from the first time zone copy.

EMC TimeFinder saves you the time it takes to make the copies. The copies begin to synchronize and finish the synchronization by the time the job step finishes. If copies normally require one hour each, EMC TimeFinder compresses the workload and saves those hours of copying time. The batch stream runs the same with EMC TimeFinder, except it runs faster without sacrificing production time to make copies (i.e., a three-hour time savings with the above payroll application example).

Data Warehousing and Decision Support

Managers know that “fresher” data allows a data warehouse or decision support system to and provide more value. Unfortunately, daily demands and lack of time often force the scheduling of data warehouse refreshing for off hours, weekends, or at irregular intervals.

But what if the corporation didn’t have to interrupt the production system? EMC TimeFinder allows managers to keep production systems running with minimal disruption while offloading critical metadata to a data warehouse for analysis. EMC TimeFinder allows you to establish a
BCV, briefly quiesce the production system to ensure “clean data,” and then split the BCV. Temporarily quiescing primary device applications ensures that all host buffering and intermediate caching is flushed to the appropriate logical device on the Symmetrix, thereby creating a coherent copy of the data.

Managers now have a fresh copy of data to update their data warehouse as frequently as needed without impacting their production systems.

**European Currency Conversion Testing**

Many banking and finance industries span countries and currencies to conduct business. The introduction of a European common currency in 1999 injects more complexity into these financial markets because of changes to conversion routines and trading programs and the need to track new currency fluctuations. At one level, money managers must change their conversion routines to trade the new currency; at another, retailers must match their local rates with the common currency. Everyone doing business in Europe will have to accommodate both local and common currencies.

EMC TimeFinder offers managers a means to test and analyze the impact of the new currency without affecting ongoing production systems. By establishing a BCV, a test environment can be created that safely allows testing against real data versus a representative sample of the data. This will enable comparisons from the test data to the production data for verification. All of this can be accomplished as often as needed without the possibility of corrupting the production data.

**Year 2000 Testing**

The industry as a whole has understood the problem associated with using a two-character date field for a long time. As calendars change from 1999 to the year 2000 and the two-character date field in computer transactions appears less than the previous year, significant processing and application disruptions will occur unless substantial and timely adjustments or corrections in data stores and applications are made.

EMC TimeFinder offers managers a complete copy of production data to test Year 2000 scenarios. By establishing a BCV, a test environment can be created that safely allows testing against real data versus a representative sample of the data. This will enable comparisons from the test data to the production data for verification. All of this can be accomplished as often as needed without the possibility of corrupting the production data.

**Backups/“Race to Sunrise”**

Questions of resource allocation confront IT managers daily because user demands for information leave little time for backup functions. In addition, managers must handle increasing amounts of data, shrinking time periods for online systems backup, and the pressure placed by multiple time zone operations for 24-hour-a-day, 7-day-a-week access to applications and data. Today, the traditional period of downtime during the early morning hours for backups results in the classic “race to sunrise.” IT managers are racing to get online systems up in time to meet users’ demands. As online data stores grow and windows of online system outages shrink, this race becomes more and more difficult to win. To compensate for this shortening window, managers have added automated tape libraries or tape drives to backup the increasing amount of data in the time window available. In almost all cases, the tape drives and libraries are relatively idle outside of the backup window.
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EMC TimeFinder lets you create a copy of the data on a BCV. This copy can be used at any time for the backup of the data, thereby not only eliminating the race to sunrise but also providing the option of choosing not to race. Resources such as tape drives and tape libraries can now be utilized 24 hours a day, 7 days a week, potentially reducing the number of tape drives and libraries required.

**Disaster Recovery**

Unscheduled outages can result in lost data and require the capability to restore the data to a known state. Symmetrix offers unscheduled outage protection with SRDF. By adding EMC TimeFinder to the SRDF process, you can test the disaster recovery scenario without compromising the disaster recovery scenario capability.

You can split off the BCV and then run a complete disaster recovery test while maintaining your disaster recovery protection. EMC TimeFinder provides a separately usable copy of the data, without compromising disaster recovery or security.

**Data Exchange**

Transfers between mainframes and servers require shutting down — or otherwise impacting the performance of — the application running on the mainframe and/or server. By using a BCV, you can make a point-in-time copy of the data and transfer the data from one system to the other while the applications are up and running. EMC TimeFinder eliminates the downtime that the applications would normally require for the transfer time. Thus, EMC TimeFinder provides a platform from which users can exchange data and enable rapid sampling of cross-platform (host/server) data.

**Environmental Refresh**

In today's IT environments, components that comprise an enterprise are constantly changing whether it is for maintenance releases, upgrades, introduction of new technology or even regulatory mandates. Every data center is looking for enhanced technology features to meet their business objectives. By using a BCV, a business can test or stage changes before rolling out to production. This provides customers the highest assurance that product rollouts will happen as smoothly as possible, keeping their environments up and running, available for business.
Partnerships and TimeFinder

**Oracle**

EMC Corporation and Oracle have worked together to enable Oracle customers to backup, resilver and restore large amounts of data without jeopardizing data integrity or performance. Oracle, with EMC, provides the ability to quiesce the Oracle application running on the primary device to assure that all host buffering and intermediate caching is flushed to the appropriate logical device on the Symmetrix, thereby creating a consistent copy of the data. This ability allows the Oracle application to continue to run while providing the ability to split off a BCV to do work on the secondary copy of data without risking data integrity issues or degradation in performance.

**SAP**

Developed by SAP, Split-Mirror Backup integrates SAP’s Oracle backup utilities with EMC TimeFinder and SRDF, providing an innovative, enterprise backup solution. This integration enables SAP Oracle backups to be taken from TimeFinder and SRDF volumes without impacting the performance or availability of production servers and disks.

**Other Solutions**

EMC’s strategy is to grow the number of applications that can be integrated with EMC TimeFinder to provide the highest availability to customer environments while ensuring data integrity and performance. EMC is in the process of working with additional partners to broaden the breadth of solutions offered to customers.
Chapter 3
EMC TimeFinder Detailed Description

**Multiple Mirror Process**
EMC TimeFinder is a new facility allowing a dynamic mirror to be established, synchronized with its partner, de-established, and then made addressable to a host operating system. With EMC TimeFinder, a third copy of customer data at the logical volume level is possible within a single Symmetrix. A new Symmetrix device type is introduced with EMC TimeFinder, the Business Continuance Volume (BCV). This additional mirror image of a device is addressable by the host. This allows a mirror of a production volume to be synchronized and put to productive use. The normal rules of Symmetrix mirroring must be maintained. Specifically, volumes must be protected, either through local mirroring, a RAID-5 configuration, or SRDF.

**Mirrored BCVs**
With EMC TimeFinder, you can create a mirror for additional protection of a BCV when the BCV is split.

![Diagram of Multiple Mirror Process]

EMC TimeFinder is a combination of host software and Symmetrix microcode. Host software enables customers to alter the state of BCVs and control the sequence in which these alterations occur. The host components also provide the ability to invoke user-written processes to control the usage of BCVs.

**Locally Mirrored Implementation**
In creating a BCV, EMC TimeFinder dynamically creates a background mirror image of any standard volume. Most importantly, the BCV contains independently addressable characteristics that let you run competing workloads in parallel. In effect, EMC TimeFinder:

- Creates and controls a mirrored copy of any volume.
- Allows the host to directly address the mirror.
- Uses the mirror for alternative processing requirements.
- Is not separately addressable from the host/server while the BCV is established.
- Allows a BCV to be mirrored when it is split.
With EMC TimeFinder, you can maintain many copies of the same data by establishing and splitting as many copies as required with one active BCV volume per production volume at a time. Note that this scenario can be applied to a RAID-S environment as well.
Non-Disruptive Implementation

With EMC TimeFinder you can define and configure BCV's without an IML.

RAID-S Implementations

With EMC TimeFinder, you can attach a BCV to a RAID-S logical volume and achieve the same capabilities, features, and functions associated with attaching it to an M1 mirrored volume. The parity volume cannot have a BCV established to it.

EMC TimeFinder with SRDF

By adding EMC TimeFinder to the SRDF solution, you have the capability to maintain disaster recovery across the link, as well as the ability to split off the BCV and to perform backups or other activities. Most importantly, EMC TimeFinder operates without compromising disaster recovery readiness because the SRDF link is never broken.

When mirroring data to a disaster recovery site, EMC TimeFinder lets you test the system without shutting down the mirroring capability or compromising disaster recovery implementation. You can attach another volume, synchronize it, split it off, and then run the necessary disaster recovery test.
Using a BCV as an SRDF Source

In this example a BCV will automatically take on the characteristics of an SRDF source volume when the BCV is split and then have the capability to be mirrored to another remote Symmetrix at a disaster recovery site.

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**SRDF Source BCV**

In this example, three copies of the logical volume would be created: two locally and one remotely. The local BCV can be split and separately addressed.

**SRDF Target BCV**

In this example, three copies of the logical volume would be created: one locally and two remotely. The remote BCV can be split and separately addressed.

**SRDF Source and Target BCVs**

In this example, four copies of the logical volume would be created: two locally and two remotely. Both BCVs can be split and separately addressed.
In this example, six copies of the logical volume would be created: three locally and three remotely. The two BCVs, one local and one remote, are able to be separately addressed.

In this example, six copies of logical volume 2 would be created: three locally (parity counts as one) and three remotely (parity counts as one). The BCVs on the source side and the target side are separately addressable.

In this example, six copies of each logical volume can be created, and the source and target BCVs can be split off and separately addressed for each logical volume in the RAID group.
**Snap Utility**

EMC's Snap Utility takes a point-in-time copy of data at the dataset or volume level for high-speed availability and local duplication of data. Once the Snap command is issued, data movement from the source dataset to the target dataset, which is dynamically allocated on a BCV, is initiated. At this time, a second copy of data is available — it has either been copied to the BCV or retrieved from the source. The BCVs used by the Snap operation must be pre-established prior to the Snap command being issued and are kept online. Multiple copies of a dataset may be taken with the Snap functionality.

Other features of the Snap Utility include:

- Quicker access to data, since users no longer need to wait for a split and volume re-conditioning to complete for the BCV to be made available to the system.
- The ability to make multiple copies of data concurrently. The first copy of the data can continue to be modified by the application. Subsequent copies of data remain frozen at the moment when the Snap command was executed and can be used to perform, for example, concurrent daily backups or application testing. Users thus have extremely fast access to multiple copies of data produced as a result of a single command.
- The ability to specify datasets with a wild card character.
- Ease of use. It is not necessary to specify the full name of every dataset to be snapped. A single Snap operation can copy an unlimited number of datasets.
- Full SMS support so that once the target dataset is dynamically allocated, a specific storage, management, or data class can automatically be assigned to the target dataset.

**Managing BCVs**

Managing a BCV requires host management utilities to control the creation of a BCV pair with a standard volume and the synchronization of data between the volumes. TimeFinder comes with command line utilities available on MVS, UNIX, and Windows NT host systems. Starting with Symmetrix 5x64 microcode, BCV volumes residing on any Symmetrix ESP-supported host systems can be managed from one of the supported TimeFinder management platforms.

**Standard Management Utilities**

Standard Management Utilities (included with TimeFinder software license) include a Command Line Interface (CLI) for UNIX and NT as well as an MVS batch utility for monitoring and executing TimeFinder operations as part of a batch job. The TimeFinder MVS Snap Utility and Conversion Utility are included as part of the standard management utilities.

**Optional Management Utilities**

The Symmetrix Manager Base Component provides a Graphical User Interface (GUI) to define TimeFinder BCV pairs. It is also a prerequisite for Symmetrix Manager Control Option.

Symmetrix Manager Control Option provides full monitoring and control of TimeFinder BCVs via a Windows NT or UNIX Motif GUI. The utilities can be used in combination with other TimeFinder management interfaces. For example, they can be used to monitor the status of TimeFinder operations initiated via the CLI or batch interface.

The Symmetrix Manager Control Option also includes Symmetrix Remote Data Facility Host Component. The SRDF Host Component is an MVS subsystem for monitoring SRDF status and controlling SRDF processes through the use of commands executed at the MVS host console. SRDF Host Component also has commands that control TimeFinder BCVs. The SRDF Host Component provides control of SRDF and BCVs from a single started MVS task.
The following chart lists operations and commands that manage BCVs in EMC TimeFinder.

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<thead>
<tr>
<th>Operations</th>
<th>Commands</th>
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<tr>
<td>establish</td>
<td>ESTABLISH</td>
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<tr>
<td>split</td>
<td>SPLIT</td>
</tr>
<tr>
<td>re-establish</td>
<td>RE-ESTABLISH</td>
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<tr>
<td>restore</td>
<td>RESTORE</td>
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<tr>
<td>incremental restore</td>
<td>RESTORE</td>
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<td>SETUP</td>
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<tr>
<td>QUERY</td>
<td>QUERY</td>
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<td>VERIFY</td>
<td>VERIFY</td>
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<tr>
<td>GLOBAL</td>
<td></td>
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<tr>
<td>USEREXIT</td>
<td></td>
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<tr>
<td>not ready</td>
<td>NR</td>
</tr>
<tr>
<td>reserves BCVs</td>
<td>HOLD</td>
</tr>
<tr>
<td>BCV available to host</td>
<td>AVAIL</td>
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<tr>
<td>returns to AVAIL</td>
<td>RELEASE</td>
</tr>
<tr>
<td>condition the BCV with the new VOLSER</td>
<td></td>
</tr>
<tr>
<td>define the volumes to process</td>
<td>PROCESS</td>
</tr>
<tr>
<td>define catalog to use</td>
<td>CATALOG</td>
</tr>
<tr>
<td>rename datasets</td>
<td>RENAME</td>
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</table>

EMC TimeFinder lets you create several host-based business continuity operations and control these operations through host commands. You 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, you can re-establish the BCV pair. Typical BCV operations include establish, split, re-establish, restore, incrementally restore, and query.

- **Establish a BCV Pair** — A newly configured and initialized BCV device contains no data. Establishing a BCV pair (e.g., a BCV device and a standard device) assigns the BCV as the next available mirror of a standard Symmetrix device and copies the contents of the standard device to the BCV.
• *Isynch* — The point in time when a BCV pair achieves initial synchronization. For example, when a BCV pair is established, M1 is not equal to BCV. When BCV equals M1, Isynch is complete.

• *Split a BCV Pair* — Splitting allows the system to execute business continuity processes with the BCV device. This process reassigns the BCV mirror to its original host address and makes the BCV device available to the host in seconds. By splitting the BCV from a standard Symmetrix device, the BCV gains a separate device address and becomes available to a host system. The standard device mirrors remain unaffected by the split and continue to work as before. The BCV device contains a copy of the data from the standard device that remains valid as of the point in time when the split command was issued.

Splitting a BCV Pair

• *Re-establish a BCV Pair* — The process where a BCV is re-assigned as a BCV mirror to the same standard device it was assigned to prior to a split process taking place. This process refreshes the BCV mirror with updates on the standard device and discards updates on the BCV mirror that occurred while the two were separated. This allows a quick resynchronization of the BCV pair.

Re-establishing a BCV Pair

• *Restore a BCV* — The restore operation assigns the BCV as the next available mirror of a standard Symmetrix device and copies the contents of the BCV to the standard device. The standard device mirrors one and two (M1 and M2), will have become copies of the data from the BCV.
Incrementally Restore a BCV Device

The process where a BCV is re-assigned as a BCV mirror to the same standard device it was assigned to prior to a split process taking place. This process refreshes the standard device with updates on the BCV devices and discards updates on the standard device that occurred while the two were separated. If no updates have taken place on the BCV device, this process may be used to roll back a standard device to a known state.

Mainframe Commands

EMC TimeFinder provides commands to execute business continuity operations for mainframe systems. Mainframe commands include ESTABLISH, RE-ESTABLISH, SPLIT, RESTORE, QUERY, VERIFY, GLOBAL, and USEREXIT.

- The ESTABLISH command assigns the BCV as the next available mirror of a standard Symmetrix device and copies the entire contents of the standard device to the BCV device. The BCV device address remains unavailable to any host while the device remains in an “established” state.

- The RE-ESTABLISH command synchronizes a previously suspended standard/BCV pair and makes the BCV “not ready” to the host. Only the data changed on the standard device will be copied to the BCV. The RMT parameter specifies that the restore affects remote devices in an SRDF configuration.

- The SPLIT command splits the specified BCV standard pairs and returns to normal operation. The BCV device address becomes available to any host. To ensure that the split pair contains an updated and consistent copy at the time of termination, the system confirms that synchronization is completed between the standard and BCV mirror. The host can resume operation with the standard Symmetrix device after completing the split operation.

- The RESTORE command assigns the BCV as the next available mirror of a standard Symmetrix device and copies the entire contents of the BCV device to the standard device. The BCV device address remains unavailable to any host while the device remains in a “restored” state.

- The CONFIG command specifies HOLD, RELEASE, NR, and READY conditions for the BCV devices.

- The NR parameter sets BCVs to not ready.
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- The READY parameter sets BCVs to ready.
- The HOLD parameter enables a BCV to be reserved at split time to prevent its being used for other commands. There are two ways to put BCV in HOLD status: perform a split or issue a HOLD command to any dataset or BCV.
- The RELEASE parameter puts a BCV back into “AVAIL” mode.
- The QUERY command reports the status of all BCV devices, including the device availability status and the corresponding standard device. This command returns device records for each BCV device defined in the Symmetrix unit, including:
  - BCV device number
  - Standard device number (for established BCV pairs)
  - Invalid track count for BCV and standard mirrors
  - Five levels of BCV availability status, including:
    - available
    - available and previous action did not complete
    - in use with standard device
    - in use and establish is in process
    - split from standard device in progress
- The GLOBAL command sets default values for all commands. The Symmetrix system allows only one global command.
- The USEREXIT command passes control to a user-written program during the processing of EMC TimeFinder actions.

Open Systems Commands

EMC TimeFinder provides commands to execute business continuity operations for open systems. Open systems commands include ESTABLISH, RE-ESTABLISH, SPLIT, RESTORE, QUERY, VERIFY, and SETUP.

- The ESTABLISH command assigns the BCV as the next available mirror of a standard Symmetrix device and copies the entire contents of the standard device to the BCV device. The BCV device address remains unavailable to any host while the device remains in an “established” state.
- The RE-ESTABLISH command synchronizes a previously suspended standard/BCV pair and makes the BCV “not ready” to the server.
- The SPLIT command splits the specified BCV pairs and returns to normal operation. The BCV device address becomes available to any host. To ensure that the split pair contains an updated and consistent copy at the time of termination, the system confirms that synchronization is completed between the standard and BCV mirror. The host can resume operation with the standard Symmetrix device after completing the split operation.
- The RESTORE command assigns the BCV as the next available mirror of a standard Symmetrix device and copies the entire contents of the BCV device to the standard device. The BCV device address remains unavailable to any server while the device remains in a “restored” state.
- The QUERY command reports the status of all BCV devices, including the device availability status and the corresponding standard device. This command returns device records for each BCV device defined in the Symmetrix unit, including:
• BCV device number
• Standard device number (for established BCV pairs)
• Invalid track count for BCV and standard mirrors
• Four levels of BCV availability status, including:
  – available and never established (only the BCV device number is valid)
  – available and previously established with standard device
  – in use with standard device
  – split from standard device in progress

The VERIFY command confirms the completion of the BCV synchronization process. The display shows the BCV device number, standard device number, invalid track count for BCV and standard mirrors, and synchronization percentage.

The SETUP command reports device types and sizes, and matches the Symmetrix device serial number with its host device number. Run this command on initial setup or when you make configuration changes to the host or Symmetrix units.

Note: This command should be run before executing Establish or Restore commands.

**Installation and Planning**

To run EMC TimeFinder, you need a Symmetrix system that supports 5x63 level microcode or above, the appropriate host/server management component, and additional physical disk space. To use the Snap Utility and newer enhancements, the Symmetrix system must support 5265 microcode. (Only Symmetrix 5xxx and 3xxx systems support 5265 microcode.) Contact your EMC representative for current support listings.

Proper planning plays an important role in configuring a system to run EMC TimeFinder. You should analyze how you plan to implement business continuance volumes (e.g., load a data warehouse, calculate Year 2000 scenarios, handle payroll backups, etc.) and confirm all the volumes for which you need to create a BCV during the planning process. Proper planning aids in defining hardware requirements.

**Symmetrix Hardware Requirements**

As an example of the type of hardware planning necessary to add EMC TimeFinder to a Symmetrix system, consider a need to run full-volume backups. A gating factor in the analysis is the number of simultaneous backups required. This number indicates the number of BCVs needed in the particular Symmetrix system. With four tape drives, you can run four simultaneous backups. One user might find four BCVs sufficient while others, running one backup after another, might require eight BCVs. Any analysis should consider these user preferences and confirm that the configuration guidelines specify the correct number of BCVs. The Snap Utility for MVS, which allows copying at the dataset level, may require fewer BCVs.

**Mainframe and Open Systems Requirements**

EMC TimeFinder requires hardware with sufficient disk space to hold the software. The EMC TimeFinder Batch Utility requires an MVS operating system environment. When running MVS/ESA under VM, the EMC TimeFinder Batch Utility requires dedicated volumes or unsupported device types.
**Host System Requirements**

<table>
<thead>
<tr>
<th>Host System</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEC Alpha</td>
<td>Digital UNIX 3.2A through 4.0</td>
</tr>
<tr>
<td>HP 9000 with HSC controller</td>
<td>HP-UX 10.0.1 through 11.0</td>
</tr>
<tr>
<td>HP 9000 with HP-PB (NIO) Controller and HP-PB SCSI pass-thru through patch available from HP on CD B3782-10132 or later</td>
<td>HP-UX 10.20 through 11.0</td>
</tr>
<tr>
<td>IBM Mainframe or compatible</td>
<td>MVS/ESA 4.3 or higher</td>
</tr>
<tr>
<td>IBM RS6000 &amp; and SP2</td>
<td>AIX 3.2.5 through 4.1.4</td>
</tr>
<tr>
<td>Intel PC</td>
<td>Windows NT 4.0</td>
</tr>
<tr>
<td>NCR 3000, 5000 Series</td>
<td>SVR4 3.0 or 3.0.1</td>
</tr>
<tr>
<td>Sequent Symmetry</td>
<td>DYNIX 4.2.1 through 4.4.1</td>
</tr>
<tr>
<td>NUMA-Q</td>
<td>DYNIX 4.4.0 or 4.4.1</td>
</tr>
<tr>
<td>SGI Challenge S, L, DM &amp; and XL</td>
<td>IRIX R6.2</td>
</tr>
<tr>
<td>Siemens RM 400, 600, 1000</td>
<td>SINIX 5.4.3</td>
</tr>
<tr>
<td>Sun SPARC</td>
<td>Solaris V2.4 through 2.6</td>
</tr>
</tbody>
</table>

*Contact your EMC representative for current information about the open system platforms that EMC TimeFinder supports.*

**Usability Considerations**

The following scenarios illustrate EMC TimeFinder's possible uses, several tasks you can perform, and the value of EMC TimeFinder and the software capabilities.
Scenario 1: Production Database Backup/Winning the "Race to Sunrise"

EMC TimeFinder can create a completely synchronized copy of the database environment using automated processes in an MVS/CICS workload environment. Scenario 1 illustrates how EMC TimeFinder creates a copy of the multi-volume production database when four standard devices (table spaces, index spaces, catalog, and director information) comprise the database environment.

EMC TimeFinder Production Database Backup

<table>
<thead>
<tr>
<th>Step</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 1    | BCV devices are addressable to host system. The host sees BCV devices as any other online volume. Vary the BCV devices offline. Most MVS environments allow the submission of operator commands from auto-ops utilities, automating the offline procedure.  

**Note:** Coordinate Step 2 with the customer’s automated operations procedures. |
| 2    | Establish four BCV pairs, using four separate EMC TimeFinder commands, and allow the standard devices to contain the production database environment. The MVS host environment allows simultaneous execution of these commands.  

**Result:** The EMC TimeFinder process enters a wait state until all BCV mirrors achieve initial synchronization (ISynch) status with an associated standard device. |
| 3    | Quiesce transaction activity and flush database buffers. A user-written program executes after the completion of ISynch. This program performs the following tasks:  

- Communicate with CICS to quiesce all transactions that write to the database being copied.  
- Set the database objects being copied to read-only access.  
- Quiesce the database to establish a “point of consistency.”  

**Note:** DB2 sets read-only access with the command “START DATABASE (database name) SPACENAM (tablespace name) ACCESS (RO).” DB2 establishes a “point of consistency” with the QUIESCE utility.  

**Result:** The EMC TimeFinder process enters a wait state until the user-written process executes. |
4 Split the BCV pairs.

**Result:** As the BCV mirrors transition back to BCV devices, Symmetrix makes the BCV devices accessible by their original device numbers.

**Note:** This scenario assumes that the volumes are varied online to a different MVS image for backup processing. Varying these devices online to the same MVS image presents a problem because MVS does not allow two online volumes with the same volume serial number (volser). To resolve this problem, you can add a volume serial relabel function, and use the TimeFinder conversion utility to rename and recatalog datasets. See Scenario 3 for details.

5 BCV devices become available for backup processing.

Several issues require attention when using EMC TimeFinder to facilitate point-in-time backups of production databases. DB2, for example, expects updates of information pertaining to image copy in its own system structures, such as the DB2 catalog.

In addition, IBM provides documented procedures to perform database recovery using a data copy not created by DB2 utilities. Some environments may use these procedures as an appropriate method of establishing points of consistency. If so, use the LOGONLY option of RECOVER, which causes the RECOVER utility to skip the RESTORE phase and apply the log records only starting from the first log record written immediately after backing up the dataset. You can use mirror image copies of production volumes for business purposes other than backup processing. For example, use BCV devices to extract, translate, and load a data warehouse, direct decision support, or perform Year 2000 testing tasks. Remember to address DB2 system structure issues. To expand Scenario 1, consider an MVS image dedicated to providing backup services for other MVS images within the same processing complex.
In this scenario, the MVS systems are logical partitions (LPARs) on an S/390® mainframe. The three systems include a customer care application (ABCD), a customer billing application (WXYZ), and a MVS system application (BKUP) providing backup services for systems ABCD and WXYZ.

The same procedures described in Scenario 1 are performed on the production MVS systems at 2 a.m. The BCV pairs split and the BKUP system performs backup processing against the BCV devices.

Note: If you expand this scenario to include several multi-volume databases, you can understand the pressures inherent in a typical “race to sunrise” with demands placed on IT managers to backup the data before a certain time.

This scenario introduces new challenges. You may not have a duplicate volser on any of the MVS images comprising the sysplex. Catalogs and SMS considerations make point-in-time backup procedures more complex. Remember, EMC TimeFinder provides an enabling technology to win the race to sunrise in the MVS environment. The total solution requires support from qualified independent software vendors (ISVs) with experience in creating effective database utilities for the MVS environment. EMC is working with these ISVs to develop suitable tools.

Note: Although Scenario 2 focuses on a MVS/CICS workload, the same procedure — although much simplified — works in a UNIX/Oracle environment. MVS issues do not apply to the UNIX environment because several UNIX disks can have the same label. UNIX systems do not present the same issues as an MVS environment.
Scenario 3:
Using a BCV in the same MVS LPAR

To expand Scenario 2, consider the need to process data on the BCV from the same LPAR.

In this Scenario, after the BCV is split, the BCV conversion utility would be invoked to:

• “Clip” the volser
• Modify VVDS and VTOC index Format-1 DSCBs
• Modify DASD volser references in the VVDS
• Modify dataset names in the VTOC
• Dynamically “DEFINE RECATALOG” datasets to temporary catalog or existing catalogs.

The procedures above now allow you to fully access, process, backup and restore all data on the BCV at the dataset level.

Note: The MVS Snap dataset command accomplishes the same functions as the BCV conversion utility.
Scenario 4: Point-in-Time Backup of an Oracle Database

This scenario demonstrates how to use EMC TimeFinder to create a point-in-time backup (PIT-B) of an Oracle database which contains production database tables spread across four standard devices. The Oracle database also contains two redo logs residing on separate standard devices. Using automated UNIX script processes, EMC TimeFinder creates completely synchronized point-in-time backup copies of the database tables.

### TimeFinder Point-in-Time Backups (PIT-B) of an Oracle Database

**Step Explanation**

<table>
<thead>
<tr>
<th>Step</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Establish a BCV pair with each disk containing a segment of the Oracle database and the primary redo log file.</td>
</tr>
<tr>
<td>2</td>
<td>Wait for ISynch to complete.</td>
</tr>
<tr>
<td>3</td>
<td>Connect to the Oracle database and issue “ALTER DATABASE START BACKUP” command.</td>
</tr>
<tr>
<td></td>
<td><strong>Result:</strong> Oracle commits all buffered database updates to disk; executes the UNIX “SYNCH” command (if the database uses UNIX file system I/O to ensure that committed I/Os are physically written to disk); and synchronizes and switches the redo log file. Oracle does not commit subsequent database updates until the system indicates the completion of backup processing.</td>
</tr>
<tr>
<td>4</td>
<td>Split the BCV pair.</td>
</tr>
<tr>
<td>5</td>
<td>Connect to the Oracle database and issue the “ALTER DATABASE END BACKUP” command.</td>
</tr>
<tr>
<td>6</td>
<td>Backup processes the production table spare, redo log(s), and associated control file to ensure a consistent PIT backup.</td>
</tr>
</tbody>
</table>

This procedure produces a safe point-in-time backup copy of the sensitive production database. The customer in this scenario can use the database mirror image for alternative processing requirements, including the creation of tape backups when needed. This process repeats daily at 6 p.m.

Having two strategically scheduled point-in-time copies of the data (e.g., 6 a.m. and 6 p.m.) allows the customer to roll back the database to a known point should a catastrophic malfunction affect the application.
Chapter 4
Symmetrix Software Solutions and Service

Software Solutions

Information Protection - EMC provides software solutions that maintain continuous data availability. The standard features of Symmetrix software solutions facilitate continuous data availability in the event of any major system component failure or power outage, and provide the ability to repair or replace the failed component without any interruption in operation. Symmetrix software solutions continually perform self-diagnosis to identify and correct potential problems prior to any disruption of data availability. Software products include:

• Symmetrix Remote Data Facility (SRDF)
• EMC TimeFinder
• Symmetrix Data Migration Services (SDMS)
• EMC CopyPoint

Information Sharing - Symmetrix offers centralized, sharable information storage for supporting changing environments and mission-critical applications. This leading-edge technology begins with physical devices shared between heterogeneous operating environments and extends to specialized software that enhances sharing information between disparate platforms. These software solutions include:

• Symmetrix Enterprise Storage Platform (ESP)
• EMC Celerra File Server
• EMC InfoMover (the former Symmetrix Multihost Transfer Facility (SMTF))
• DataReach

Information Management - Symmetrix consolidates storage capacity for multiple hosts and servers and improves information management. The Symmetrix Manager family of products further enhances this efficient, consolidated storage approach. These optional software solutions include powerful GUI-based tools that simplify Symmetrix configuration, performance, and status information gathering and management. These products include:

• EMC Data Manager (EDM)
• FDR Family of Backup/Restore Solutions
• SRDF Host Component
• Symmetrix Manager
• EMC PowerPath

For more information about EMC Enterprise Storage solutions, contact your EMC sales representative.
EMC Professional Services consultants provide a full range of services to enable you to extract maximum value from your information and achieve The EMC Effect. These services assist you in applying EMC Enterprise Storage concepts and capabilities to your business issues. The EMC approach enables you to put information at the center of your IT infrastructure so you can take control of your information and utilize it to your full advantage.

Professional Services help you leverage EMC Enterprise Storage solutions, expertise, and resources to achieve success faster, more cost effectively and with less risk. They enable you to:

- Understand your current IT environment and take charge of it.
- Create a more responsive, efficient, and flexible IT infrastructure with information at its center.
- Share, protect, and manage critical information across the enterprise.
- Deploy robust new enterprise solutions faster.

EMC Professional Services personnel utilize EMC Storage Logic™, a framework of EMC-specific and storage industry best practices that addresses all phases of an enterprise solution. Use of this framework ensures consistency and quality of deliverables and facilitates effective management of project budgets, schedules, and specifications.

To help you build an IT infrastructure that takes full advantage of all your critical information, EMC Professional Services provides both strategic enterprise consulting services and practical enterprise software implementation services. Consulting services help you assess your current infrastructure in light of your requirements and sort through various options. Implementation services help you integrate a specific hardware and software solution into your unique environment.

Enterprise Business Continuity services protect and enhance your ability to generate revenue. They help you build an enterprise business continuity infrastructure that not only eliminates unacceptable downtime (planned and unplanned) but also creates new ways to capitalize on business opportunities to generate increased revenue and customer services.

Enterprise Business Continuity services help you map and build your infrastructure to satisfy a range of business continuity requirements from high availability to mission-critical availability to continuous availability to disaster recovery. Assessment, planning and design, and software implementation assistance is available.

Use of EMC Professional Services personnel for implementation enables you to quickly realize the advanced functionality of EMC software, while your in-house IT staff continues with other revenue generating activities. A range of TimeFinder software implementation services are available, from basic software installation to complex integration projects that encompass the complete project lifecycle. Regardless of the level of complexity, EMC Professional Services personnel can address your unique technical, staffing, or timing requirements.

In addition to software implementation services for such key business continuity products as TimeFinder, SRDF, and EDM implementation services are also available to help you expand your information sharing, management, and protection capabilities by adding other EMC software products to your infrastructure.
Enterprise Storage
Architecture and Design

Enterprise Storage Architecture and Design is the most consultative practice. Its services give you a broad-based overview of your IT environment and indicate where and how enterprise storage can enhance it. Assessments recommend specific storage-related initiatives that can help you compete in your marketplace or otherwise increase the value and effectiveness of your infrastructure.

Enterprise Storage Network

Enterprise Storage Network services help you break out of current network limitations. They help you cost-effectively consolidate information from heterogeneous sources to offload data movement from your general-purpose network and improve information protection, sharing, and management. EMC experts in this new field of storage networking help you assess, plan, design, and implement an Enterprise Storage Network infrastructure that addresses today’s requirements and can grow with you into the 21st century.

Support and Service

The EMC Customer Support Center, headquartered in the United States, directly supports EMC software products.* The following telephone numbers offer technical support:

U.S. (800) 782-4362 (SVC 4EMC)
Canada: (800) 543-4782 (543-4SVC)
Worldwide: (508) 497-7901 (or contact the nearest EMC office)

*BMC Software directly supports the DataReach product. Innovation Data Processing directly supports the FDR Family of Backup/Restore Solutions.