IBM System Storage DS8000 and DS6000 Advanced Copy and Mirroring Functions

The challenges of a changing world
Maintaining competitiveness in today’s changing, global marketplace presents companies with both significant opportunities and challenges. A whole new world of potential customers, automated and streamlined processes, and new revenue streams are being fueled by the business world. Consequently, companies also face increasing requirements for more information to be universally available online, around the clock, every day of the year. Because of these developments, data backup and disaster recovery solutions have become vital to protecting the continuous daily operations and, in some cases, the actual survival of businesses today.

To address the unique requirements of this dynamic online world, the IBM System Storage DS8000™ series and DS6000™ series disk systems provide innovative technology to support business and data growth while maintaining continuous data availability.

IBM FlashCopy® point-in-time copy function is designed to help reduce application downtime through near-instantaneous internal copies of data

IBM FlashCopy SE snapshot copy function enables space efficient copies for short term backup or testing needs

IBM System Storage™ z/OS® Global Mirror offers a solution for real-time mirroring at extended distances for z/OS servers

IBM System Storage Global Mirror, Metro Mirror and Metro/Global Mirror are designed to provide real-time remote mirroring for disaster recovery and backup for IBM z/OS, IBM i5/OS®, and a wide variety of UNIX®, Linux®, VMware, Microsoft® Windows®, and other servers
The DS8000’s high performance, scalability and resiliency enable a robust infrastructure; however, data availability may be further protected through the use of optional advanced copy and mirroring functions. These functions can be critical for supporting continuous availability by helping to enable important disaster recovery and backup protection.

**Resiliency Family for business continuance**
The IBM System Storage DS6000 series, DS8000 series and IBM TotalStorage® Enterprise Storage Server® (ESS) all offer a number of Advanced Copy and Mirroring functions. These are enterprise-level, leading-edge functions designed to address an organization’s need for high availability, data duplication, disaster recovery and data migration.

- **IBM FlashCopy and FlashCopy SE**
- **IBM System Storage Metro Mirror, Global Mirror and Metro/Global Mirror**
- **IBM System Storage z/OS Global Mirror (XRC)**
- **IBM System Storage Global Copy**

**Point-in-time data copies**
Planned and unplanned outages can make critical business applications unavailable for a significant amount of time. FlashCopy and FlashCopy SE are designed to help you reduce or eliminate planned outages for critical applications that might in the past have been caused by downtime for backup. They can also help to reduce the risk of data loss and down-time from unplanned outages.

**FlashCopy**
FlashCopy offers an advanced, fast internal disk system replication facility that can help significantly reduce application outages that might have been needed for other backup and copy applications. It is designed to provide point-in-time copy capability for logical volumes on the DS6000 series, DS8000 series and ESS, and can allow access to the source data and the copy almost immediately. FlashCopy is designed to enable source data to be copied to an equivalently sized target space. These full volume copies can help enable data recovery in the event of loss of the original source data. When a copy of data is requested, both the source data and its copy are available for use almost immediately; data movement occurs in the background.

**FlashCopy SE**
FlashCopy SE offers a space efficient snapshot capability on the DS8000 that can greatly reduce the storage capacity needed for point-in-time copies. Only the capacity needed to save pre-change images of the source data is allocated in the copy repository. This enables more space efficient utilization than is possible with the traditional FlashCopy function. Furthermore, less capacity can mean fewer disk drives and lower power and cooling requirements, so FlashCopy SE can help optimize storage environments to reduce costs and complexity. FlashCopy SE may be especially useful in the creation of temporary copies for tape backup, online application checkpoints or copies for disaster recovery testing.

**FlashCopy NOCOPY option**
The efficient copy-on-write NOCOPY option within FlashCopy is designed to allow flexible reuse of disk capacity that would otherwise be dedicated to copy
operations. This option is designed to provide a unique optimization for operations with short-term copy requirements, such as backup to tape. With the NOCOPY option, rather than a physical byte-for-byte copy of the source volume, the only data copied to the target is that which is about to be changed or overlaid by the application. This option can be used to copy most or all of the data directly from the source to tape, without the need to copy all of the physical data to an intermediate backup copy first. This helps minimize the impact of internal replication on other work.

**Data Set FlashCopy**

This feature offers a new level of granularity for the z/OS environment, allowing more efficient use of the disk system capacity. It can help reduce background copy completion times because FlashCopy no longer needs to be performed at the volume level when only a data set copy is required. Data Set FlashCopy allows the source and target copy to be different sizes and allows the copied data to reside at a different location in the target volume than in the source volume (see Figure 1).

**Multiple Relationship FlashCopy**

This feature offers increased flexibility and improved capacity management and utilization. Instead of limiting a volume to a one-on-one relationship between FlashCopy sources and targets, this function is designed to allow a volume to participate in multiple FlashCopy relationships (up to 12 simultaneous relationships) so that multiple copies of the same data can be made for testing, backup and other applications (see Figure 2).
**Incremental FlashCopy**
This feature offers the ability to track and record changes that are made to the source and target volumes after the establishment of FlashCopy relationships. This provides the capability to refresh a LUN or volume to the point-in-time content of the source or target using only the changed data (see Figure 3). The refresh can occur in either direction.

**Initial FlashCopy**
(Background Copy with Change Recording enabled)

**Change Recording**
(Tracks change since last FlashCopy)

**Incremental FlashCopy**
(Copies only changed data)

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**Consistency Groups**
This feature supports the ease of use and application-level implementation of FlashCopy. It is designed to avoid host impact when creating a consistent point-in-time copy for an application that uses data which spans multiple volumes or even multiple DS6000, DS8000 or ESS systems. The Consistency Groups feature is designed to prevent initiation or completion of write I/O to the source volumes until FlashCopy completes copying the data for all volumes in a group. No operator intervention is required, which can help improve business efficiency.

**Additional features**
FlashCopy is designed to set up the point-in-time copy for a volume in one second or less. Many applications that can tolerate only a minimal pause in availability for initialization time may be viable candidates for FlashCopy. In addition, FlashCopy provides the ability for the source data and its copy to reside in different Logical Storage Subsystems (LSSs) within the same DS6000 series system, DS8000 series system or ESS.

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**Remote Mirroring**
A large percentage of businesses cannot tolerate downtime. These IBM System Storage Remote Mirroring and Copy functions can help reduce the impact of downtime by allowing businesses to replicate data to a remote site. These functions support the ability to keep local and remote copies of databases in sync and ready for quick switch-over should disaster occur.

**IBM System Storage Metro Mirror (Synchronous)** is a remote data-mirroring technique for supported servers, including mainframe and open systems. It is designed to constantly maintain an up-to-date copy of the local application data at a remote site that is within the metropolitan area (typically up to 300 km away using DWDM). With synchronous mirroring techniques, data currency is maintained between sites, though distance can have some impact on performance. Metro Mirror is used primarily as part of a business continuance solution for protecting data.
against disk storage system loss or complete site failure. This 2-site data mirroring function is designed to provide a cost-effective, metropolitan distance, high availability, data replication and disaster recovery solution.

**IBM Global Copy** is a non-synchronous, remote copy function for z/OS and open systems. It is designed to write operations complete on the primary storage system before they are received by the secondary storage system. This capability is designed to prevent primary performance from being affected by wait-time from writes on the secondary system. Therefore, the primary and secondary copies can be separated by long distances. This function is appropriate for remote data migration, offsite backups, and transmission of inactive database logs at virtually unlimited distances.

**IBM Global Mirror (Asynchronous)** is a two-site remote data mirroring function for z/OS and open systems servers. It is designed to maintain a complete and consistent remote mirror of data asynchronously at virtually unlimited distances with next to no application response time degradation. Separating data centers by longer distances helps to provide protection from regional outages. This asynchronous technique can help you achieve better performance at unlimited distances by allowing the secondary site to trail in currency a few seconds behind the primary site. With Global Mirror, currency can be configured to be as little as 3 to 5 seconds with respect to host I/O. Global Mirror consistency groups support a mix of mainframe and open data and can be created across up to eight DS6000 series systems, DS8000 series systems or Enterprise Storage Systems, allowing scalability for customer application growth. This two-site data mirroring function is designed to provide a high-performance, cost-effective global distance data replication and disaster recovery solution.

**IBM Metro/Global Mirror (3-site Asynchronous)**

For supported mainframe and open systems servers, Metro/Global Mirror is designed to enable a disk mirroring function for the DS8000 (and ESS via RPQ) that combines Metro Mirror with Global Mirror for a long-distance data replication and disaster recovery/backup solution. This function is designed to enable a three-site, global-distance data mirroring solution, with a complete and consistent copy of data at the remote site. Metro/Global Mirror uses Metro Mirror to synchronously mirror data to a second site within the metropolitan area and then uses Global Mirror to asynchronously mirror data to a remote site that can be a global distance away from the second site. This configuration can also be flexibly used in a two-site configuration using synchronous Metro Mirror, with primary and intermediate copies within the same local Enterprise Storage Server, and asynchronous Global Mirror out to the remote site.

**IBM Metro/Global Copy (Asynchronous cascading)**

For supported mainframe and open systems servers, Metro/Global Copy is designed to provide a three-site disk mirroring function for DS6000, DS8000 and ESS, that combines high availability Metro Mirror with Global Copy for a long-distance data replication/backup.
solution. This configuration is often used by existing Metro Mirror customers as a non-disruptive data migration capability. It includes Metro Mirror, a two-site high availability data mirroring solution, combined with Global Copy, a low-overhead method of replicating a copy of that data at periodic intervals to another set of disk subsystems located at a remote site (see Figure 4). This configuration is a highly preferred method to do data migration while simultaneously keeping the Metro Mirror data protection active. It can also be flexibly used in a two-site configuration. It uses synchronous Metro Mirror, with primary and intermediate copies within the same local disk subsystem and non-synchronous Global Copy out to the remote site.

**IBM z/OS Global Mirror (XRC)** is offered on the DS8000 series and the ESS Model 800. It supports the following functions:

- **z/OS Global Mirror**, a remote data mirroring function available for the z/OS and IBM OS/390® operating systems. It is designed to maintain a copy of the data asynchronously at a remote location over long distances and to provide a premium level of throughput and data integrity to the secondary site. z/OS Global Mirror is well-suited for large mainframe server workloads and can be used for business continuance solutions, workload movement and data migration. Available on the DS8000 is an innovative unique function for z/OS Global Mirror called Multiple Reader, which enables the z/OS Global Mirror I/Os to be processed in parallel by the SDM reader. This increase in parallelism can allow increased z/OS Global mirror throughput and bandwidth efficiencies. With Multiple Readers, for a given amount of bandwidth z/OS Global Mirror can better sustain the peak workloads and better maintain data currency between mirrored sites.

- **z/OS Metro/Global Mirror (three-site multi-target configuration using XRC and Metro Mirror from the same z/OS volume)**, a mirroring capability that utilizes z/OS Global Mirror (XRC) to mirror primary site data to a location a long distance away for disaster recovery. It also uses Metro Mirror to mirror primary site data to a location within the metropolitan area for a high-availability implementation. This capability is designed to provide a three-site high availability and disaster recovery z/OS solution for even greater protection from unplanned outages. This configuration is well suited to address the needs of an existing z/OS Global Mirror user that wishes to add local Metro Mirror for high availability; it is also an excellent solution for Metro Mirror customers who desire to add out-of-region recovery at an especially high level of scalability for their z/OS environment.

**System Storage Resiliency automation**

IBM also offers a number of solutions for automating and managing disaster recovery and backup in different operating system and application environments. Some examples include:

**IBM GDPS solution for IBM System z**

The business continuance capabilities of the IBM disk storage products are further integrated with System z™ Geographically Dispersed Parallel Sysplex™ (GDPS®) environments. GDPS is one of the leading availability...
solutions for IBM System z server installations. It is a multi-site solution designed to provide the capability to manage the storage and server remote copy configurations to help enable near transparent disaster recovery and continuous operations. The GDPS Open LUN Management capability can provide a cross-platform disaster recovery capability across both mainframe and open systems data. GDPS is an IBM Global Services offering.

**IBM GDOC solution for heterogeneous Open Systems**

GDOC offers a full-function, end to end Open Systems Business Continuity solution and services package for providing a high availability solution for recovery in a large multi-platform Windows, UNIX (including IBM AIX®, HP and Solaris) and Linux environment. GDOC is especially applicable where the client has multiple mission-critical Open Systems platforms, and needs a common High Availability and Business Continuity solution across all of them. The GDOC services offering provides expertise to install a robust High Availability and Business Continuity solution based upon VERITAS Cluster Server (VCS) and VERITAS Global Cluster Manager. GDOC is an IBM Global Services offering.

**IBM HACMP/XD for IBM System p™ Servers**

The HACMP™/XD Extended Distance is an optional feature of IBM High Availability Cluster Multi-Processing (HACMP) for IBM AIX 5L™, Version 5.1.0. It supports automatic failover of disks that are Metro Mirror pairs and creates a powerful disaster recovery solution for IBM AIX customers. HACMP/XD is designed to automate the management of Metro Mirror in an AIX environment, help reduce recovery time after an outage, and monitor AIX-clustered environments to help maintain continuous mirroring of critical data.

**IBM TotalStorage Productivity Center (TPC) for Replication**

Available separately, IBM TotalStorage Productivity Center software takes storage management to a new level. This suite of powerful storage management software provides a single administrative interface for the DS8000, many other individual IBM storage systems, and non-IBM disk systems that are also based on open SMI-S interfaces. IBM TotalStorage Productivity Center (TPC) for Replication is designed to provide a powerful management, automation and monitoring tool for FlashCopy, Metro Mirror, and Global Mirror remote replication functions.

**A comprehensive disaster recovery solution from IBM**

Although storage components are important to a coordinated disaster recovery plan, a complete solution with servers, storage, software, automation, networking and integration services is necessary. IBM System Storage products can help provide customers with reliable data protection, and IBM can help customers choose the components necessary to design a cost-effective solution to help address their individual requirements.