THE CLIPPER GROUP
Navigator™

Navigating Information Technology Horizons^{SM}

IBM Announces Its *TotalStorage Resiliency Family* With Speedy Asynchronous Mirroring and More

Analyst: Michael Fisch

Management Summary

It is fairly easy to decide between obviously good and bad things, but the real test of judgment and discernment is having to choose the best among several good options. For instance, should one walk on the sidewalk or down the middle of the street during rush hour? That one is easy. But which home to buy, or which features to include in a new product and which to exclude – these decisions are not as simple. They require careful attention to the details and complexities of a situation, as well as having a good sense of priorities. Which house would best satisfy the needs of family, work, budget, and personal taste? Which product features would customers be willing to pay for, at what price, and what are the estimated costs and timetables for delivering them? *Hmm, let me think about that…*

Enterprise data protection is also a challenge that requires choosing the best of several good options. An obviously poor choice would be not to protect data, but most enterprises have the foresight not to jeopardize the business in this way. They typically deploy some mix of redundant hardware, backup and restore infrastructure, point-in-time disk copies, and remote mirroring to protect their data. **The optimal mix depends on business requirements and how the parameters of cost, data exposure, recoverability, and application performance are weighted.** It is a balancing act between risk mitigation and cost.

As a new member of the *TotalStorage Resiliency Family* of enterprise-class data protection solutions, IBM recently added *Global Mirror* for asynchronous mirroring. The Global Mirror software runs on *IBM Enterprise Storage Servers (ESS*, a.k.a. *Shark)* and delivers remote mirroring over virtually unlimited distances in open systems and *zSeries* environments. There is no host server software or agents, and its asynchronous nature virtually eliminates the performance impact on IT applications. **Global Mirror is designed for high-performance transmission to the remote site. Data exposure is minimized with lag time is as low as 3 to 5 seconds. It also supports consistency groups spanning up to eight ESS platforms, in any configuration between source and target**.

Other enhancements to the TotalStorage Resiliency Family include support for up to 300 km with *Metro Mirror (Synchronous PPRC),* as well as *FlashCopy* to a PPRC primary. **These are significant new options for data protection in IBM storage environments.** Read on for details.

Real-Time Mirroring for Data Protection

Enterprises need to protect their data. Planned and unplanned outages – whether due to system failures, data corruption, local disasters, IT maintenance activities, or anything else – affect access to information, the availability and performance of IT applications, and the productivity of workers and business processes. Data may reside conceptually at the bottom of the food chain, but it is at least as important the activities and functions above that "feed" on it. **Therefore, enterprises should be prepared to cope with outages in a smooth and minimally-disruptive manner.**

Data protection solutions span a continuum of cost and recoverability points, including tape backup, disk backup, point-in-time copies, and remote mirroring. It is like buying insurance – the more comprehensive the policy, the higher the premium, and the better the protection from loss. *Recoverability* is a characteristic expressing how well data is protected. It includes the expected time until access to data is restored (recovery time objective or RTO) and how current the recovered data set is (recovery point objective or RPO). As with insurance, better recoverability costs more. An enterprise must analyze its data and perform a cost-benefit analysis

Mirroring **assumes a rightful position at the top of the data protection hierarchy.** It offers the best recoverability at a premium price, and some data is important enough to make this level of protection necessary. As its name suggests, mirroring establishes a real-time copy of production data that can be located remotely from the primary. It provides redundancy for failover purposes and protects from local disasters. A mirroring solution consists of special software, communications links and equipment, a target storage array, and a facility to house the target environment. It can also include a failover server for restarting a production application at the remote site. *See the box on next page for a description of synchronous and asynchronous mirroring.*

TotalStorage Global Mirror

IBM's enhanced *TotalStorage Global*

> ### IBM *TotalStorage Resiliency Family*
>
> The IBM TotalStorage Resiliency Family takes a multi-faceted approach to resiliency and data protection. At the base level, it offers a variety of replication, backup, and recovery technologies, such as *FlashCopy*, *Global Mirror*, *Tivoli Storage Manager*, and *Multiple Device Manager*. Next, IBM has integrated these technologies with specific host operating systems to provide capabilities like cluster failover and application restart. Examples here include *GDPS* for *zOS*, *HACMP/XD* for *AIX*, and *GDS* for *Windows*. Finally, it offers application integration to deliver capabilities like online backup and fast, automated point-in-time copies and re-stores. **IBM's comprehensive resiliency offering extends beyond data replication to reflect the final objective of continuity and recoverability of enterprise applications.**

Mirror (*Asynchronous PPRC*) is a new high-performance, asynchronous mirroring solution for IBM *Enterprise Storage Servers (ESS)*[1]. It replicates data to a secondary site over virtually unlimited distances, protecting from local disasters. Since replication is asynchronous yet speedy, it does not materially affect application performance. (If you have ever called customer service and waited for them to pull up your account or process a transaction, then you know how application delays can slow things down.) Global Mirror is an innovative solution, as highlighted by a number of patents and patents pending. Its features include:

- **Support for open systems and mainframe environments** – Global Mirror replicates volumes in environments with open systems (*UNIX*, *Linux*, *Windows*) and *zSeries* host servers. This can simplify management and infrastructure deployment with a single data protection solution for all hosts.

---

[1] Only ESS models 750 and 800 support Global Mirror.

Synchronous vs. Asynchronous Mirroring

There are two basic options for mirroring data – *synchronous* and *asynchronous*. Both offer real-time data replication to a remote site, but there are distinctions and tradeoffs between them involving distance, application performance, and data currency, not to mention cost.

A *synchronous mirror* writes I/Os to both the primary and secondary (remote) storage array before acknowledging it completion back to the application. Thus, both writes must complete before the application is free to proceed. This guarantees the protection of each and every I/O – a zero data exposure. However, there is a delay involved in writing to the remote site that is a function of the distance (the speed of light is finite and introduces real latency), workload, bandwidth, data compression, and latency across the switches, routers, and gateways in the communication path. This delay can impact application performance and the response time experienced by users. As a result, synchronous mirroring solutions tend to be limited to campus-area, metro-area, or regional distances – say up to 100 km. In short, synchronous mirroring delivers zero data exposure over limited distances with the *potential* to impact application performance.

An *asynchronous mirror* acknowledges I/Os after writing to the primary storage system only, so the application can carry on processing. The write to secondary storage is allowed to lag behind the primary. The lag time (usually a matter of seconds or minutes) depends on the distance to the remote site, workload, bandwidth, caching, compression and incremental-change algorithms (if any), and latency across communication equipment. The benefit of asynchronous mirroring is virtually unlimited distances to the remote site and no impact on application performance. It protects from local and regional disasters. The tradeoff is a relatively small amount of data exposure based on the seconds-to-minutes of lag time – though still a quantum leap over the protection afforded by nightly tape backups or even hourly snap copies.

A third option is a *multi-hop or cascaded configuration*. In this case, data is mirrored synchronously to a local/regional site, and then periodic, point-in-time copies are replicated over long distance to a tertiary location. This configuration costs the most because of the additional failover site, but it offers zero data exposure combined with protection from a regional disaster and triple redundancy – the best of all worlds!

- **No agents or software on host servers** – It is an array-based replication solution that is completely independent of host servers. Therefore, it does not consume host CPU resources, nor does it require installing host agents. Host resources are fully dedicated to application processing.

- **Minimal data exposure** – As an asynchronous mirroring solution, writes to the target array lag the primary and create some amount of data exposure. However, the performance capabilities of Global Mirror keep the lag to an average three to five seconds, offering an excellent RPO[2] and overall recoverability that is five- to ten-times faster than previous asynchrony-

ous methods. Actual lag time will depend on factors including workload, distance, and bandwidth.

- **Minimal connectivity requirements** – Global Mirror only requires two Fibre Channel links per ESS platform. This may be less than alternative solutions, helping to save on networking costs.

- **Consistency groups spanning up to eight ESS platforms** – A consistency group is a set of related volumes that are copied at the same point in time for the purpose of restarting an application. For instance, federated databases and multi-tier applications may use data sets spanning multiple volumes. To restart such an application in a failover situation, the redundant data set must be consistent at a point in

---

[2] Recovery point objective

time across the volumes. (Think of a group of soldiers marching in lockstep.) Global Mirror coordinates among the arrays and uses *FlashCopy* at the target site to make point-in-time copies of a consistency group as often as every few seconds. The application can restart from a very recent copy, which minimizes data exposure. The copy process is automated, host independent, and virtually non-disruptive to the application. This is a significant improvement over IBM's existing *Metro/Global Copy* solution, which requires manual operation and periodically suspending data availability.

Furthermore, Global Mirror allows consistency groups to span volumes in up to eight separate ESS platforms, in any combination of source and target. For instance, there can be four source platforms and four target, one and seven, seven and one, and so forth. This is a unique feature on the market, and the upshot is that an enterprise can scale storage capacity, basically without regard to the number of ESS platforms or to where volumes reside. All members of a consistency group do not have to be kept on one array, which diffuses risk of a single point of failure, simplifies management, and avoids potentially disruptive data migration operations when scaling capacity. It allows for a more modular and incremental approach to scalability, albeit with high-end ESS platforms.

Not all asynchronous mirroring solutions are alike – there are qualitative differences among them. Global Mirror is an excellent and innovative solution for advanced business continuance and data protection in IBM ESS environments. The new ESS 750[3] can also serve as a lower-cost target at the remote site. Global Mirror is scheduled for general availability on May 28, 2004.

---

[3] For more information on the ESS 750, see *A Mainframe System on a Smaller Scale — IBM's zSeries 890 and ESS 750 are Dynamic Duo* in **The Clipper Group Navigator** dated April 7, 2004, available at http://www.clipper.com/research/TCG2004031.pdf.

Other Resiliency Family Enhancements

Greater distance for Metro Mirror

Metro Mirror (*Synchronous PPRC*) is IBM's synchronous mirroring solution. It offers zero data exposure for applications that cannot afford to lose even a single I/O in the event of a local disaster. Metro Mirror on the ESS platform now extends up to 300 km between the primary and target sites with Fibre Channel links and appropriate extension technology. The benefit is greater flexibility and remoteness.

FlashCopy to a PPRC primary

FlashCopy is an array-based feature that creates point-in-time (PIT) copies of production volumes. The copies are useful for failover purposes, non-disruptive backup, data warehouse loading, and application testing and development. Now, FlashCopy copies on an ESS platform can serve as the source for a PPRC mirroring configuration, replicating PIT copies to a remote site for failover, content distribution, or other purposes.

Conclusion

Global Mirror and the enhancements to Metro Mirror and FlashCopy are the latest additions to IBM's TotalStorage Resiliency Family for ESS. The family offers a variety of data protection solutions for open systems and zSeries environments. They are integrated at the operating system and application level to promote recoverability and continuity of business operations.

In the horse race of enterprise storage, there is continual jockeying for position among high-end storage array vendors. **With Global Mirror, it appears that IBM has secured an edge in the area of asynchronous mirroring. This amounts to a check in favor of ESS for enterprises that require advanced data protection.**

About The Clipper Group, Inc.

The Clipper Group, Inc., is an independent consulting firm specializing in acquisition decisions and strategic advice regarding complex, enterprise-class information technologies. Our team of industry professionals averages more than 25 years of real-world experience. A team of staff consultants augments our capabilities, with significant experience across a broad spectrum of applications and environments.

➢ *The Clipper Group can be reached at 781-235-0085 and found on the web at www.clipper.com.*

About the Author

Michael Fisch is Director of Storage and Networking for The Clipper Group. He brings over eight years of experience in the computer industry working in sales, market analysis and positioning, and engineering. Mr. Fisch worked at EMC Corporation as a marketing program manager focused on service providers and as a competitive market analyst. Before that, he worked in international channel development, manufacturing, and technical support at Extended Systems, Inc. Mr. Fisch earned an MBA from Babson College and a Bachelor's degree in electrical engineering from the University of Idaho.

➢ *Reach Michael Fisch via e-mail at Mike.Fisch@clipper.com or at 781-235-0085 Ext. 25 (please dial 1-25 when you hear the automated attendant).*

Regarding Trademarks and Service Marks

The Clipper Group Navigator, **The Clipper Group Explorer**, **The Clipper Group Observer**, **The Clipper Group** *Captain's Log,* and *"clipper.com"* are trademarks of The Clipper Group, Inc., and the clipper ship drawings, *"Navigating Information Technology Horizons"*, and *"teraproductivity"* are service marks of The Clipper Group, Inc. The Clipper Group, Inc., reserves all rights regarding its trademarks and service marks. All other trademarks, etc., belong to their respective owners.

Disclosure

Officers and/or employees of The Clipper Group may own as individuals, directly or indirectly, shares in one or more companies discussed in this bulletin. Company policy prohibits any officer or employee from holding more than one percent of the outstanding shares of any company covered by The Clipper Group. The Clipper Group, Inc., has no such equity holdings.

Regarding the Information in this Issue

The Clipper Group believes the information included in this report to be accurate. Data has been received from a variety of sources, which we believe to be reliable, including manufacturers, distributors, or users of the products discussed herein. The Clipper Group, Inc., cannot be held responsible for any consequential damages resulting from the application of information or opinions contained in this report.