Innovative Business Continuity Solutions with Syncsort *BEX Advanced Recovery*

White Paper

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Innovative Business Continuity Solutions with Syncsort BEX Advanced Recovery

Introduction

The first decade of the third millennium is witnessing technological innovation and advancement at unprecedented rates. In the realm of information management, the following technology trends have rapidly emerged:

- Information has become extremely time-sensitive.
- Applications demand nearly continuous availability.
- Hardware and software release and redesign cycles are increasingly frequent.
- Data volumes are growing exponentially.
- Business and data resources have become more geographically dispersed.
- Regulatory and contractual requirements are increasingly stringent.
- Open system environments have put both applications and servers at greater risk.

To avoid being left behind, every organization – small, medium, or large – must position its sites, systems, servers, applications, databases, files, and data for protection not only now, but well into the future. Deploying a scalable enterprise-wide approach assures a company that they'll surface from any information disaster – folder level, server level, or site level – with no negative impact on operations.

This paper describes a single, fifth generation data protection model that assures 24 x 7 uninterrupted business continuity for your organization's mission-critical applications in all information-related disaster scenarios. As illustrated in Figure 1, this single model protects your data at all levels, from a lost file to an organization-wide crisis. At the same time the model guarantees you'll meet almost all service level agreements (SLAs) with respect to recovery time objective (RTO) and recovery point objective (RPO) expectations.

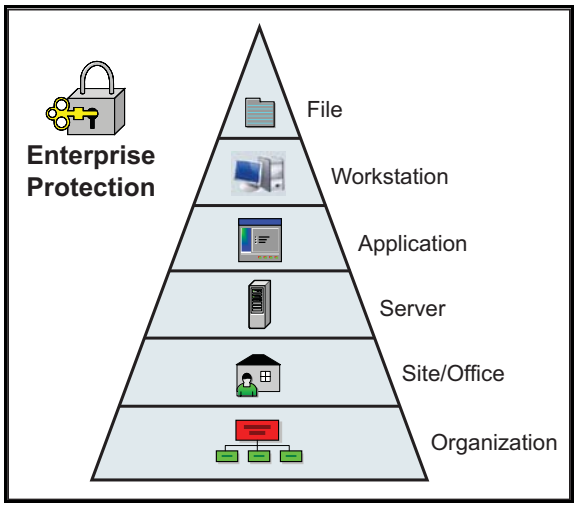

Figure 1: Tiered Risks, Single Enterprise Solution

Data Protection Needs Assessment

Organizations thrive on data and the applications that use that data. Data protection needs are very complex and include the following:

- Continuity of business for multiple operating systems and applications
- Fast and simple disaster recovery
- Central and remote site protection
- Continuous, non-intrusive, reliable backups
- Enterprise-wide coverage
- Resource efficiency, scalability, and flexibility
- Immediate recovery to any one of multiple past points in time
- Long-term data retention

These needs are further complicated by the fact that not all data and applications are the same. Some data is mission-critical, but most data is not needed immediately and its recovery can be delayed. For example, data and applications on servers used for real-time production may require recovery within hours, while those used for development may demand recovery within days, and financial records may allow for a week or more. Many organizations either self-impose, or have imposed on them, Service Level Agreements that dictate both recovery time objectives (RTO) and recovery point objectives (RPO), the two essential business resumption requirements in today's fast-paced economy.

In all cases, the optimal RTO is recovery that occurs so fast that business is not affected, and the optimal RPO is recovery as close as possible to the data state at the moment of failure. Anticipating these critical objectives has become a vital factor in data protection development.

The bottom line is that due to the trends cited in the introduction to this paper, CIOs and system administrators are forced to take action in the area of data protection. Since the turn of the millennium, improving data protection has not been an option, it has been a necessity.

An Ideal Data Protection Topography

Figure 2 illustrates an ideal fifth generation enterprise-wide data protection topography. In various forms, it is being rapidly adopted by leaders in all industries as a complete data protection solution. This topography meets RTO and RPO expectations while also meeting the eight essential data protection needs listed in the section above.

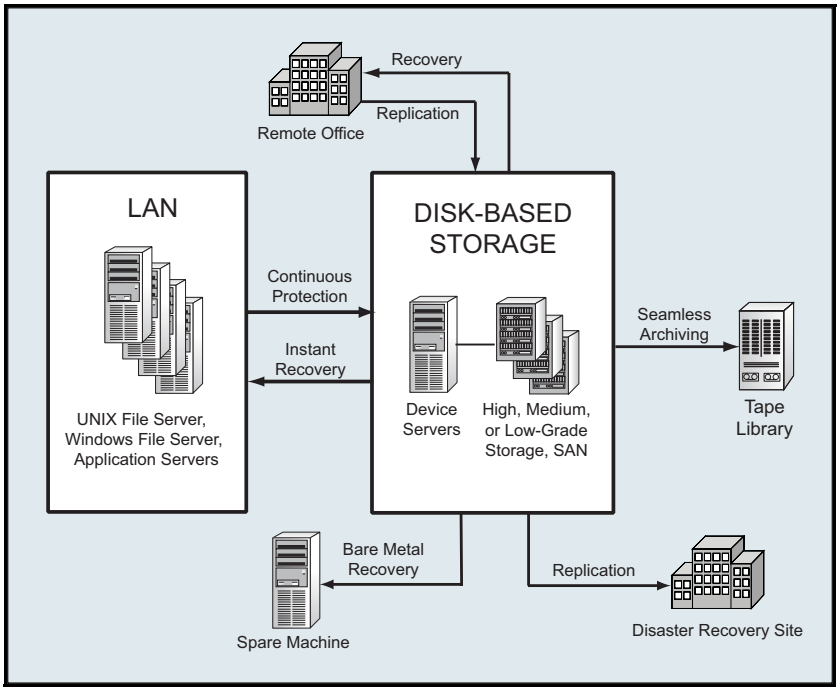

Figure 2. An Ideal Data Protection Topography

This topography, though complex at first glance, has arisen in response to industry demand – dating back to the day when the first non-mainframe network backups were required and deployed. To help explain the topography, it is useful to examine the evolution of data protection – an evolution that displays how data protection modelling has grown in lockstep with industry demands.

The following sections provide a brief history of data protection solutions, and conclude with a description of an authentic, easily deployable product that mirrors the topography illustrated in Figure 2 above.

Developing Dynamic Strategies to Match Evolving Needs

History shows us a step-wise, generational approach to data protection improvements. One way to visualize the evolution of data protection solutions is to first imagine a simple four-phase data protection circuit – source, backup, destination media, recovery – as illustrated by Figure 3, and then observe how each phase has improved over time.

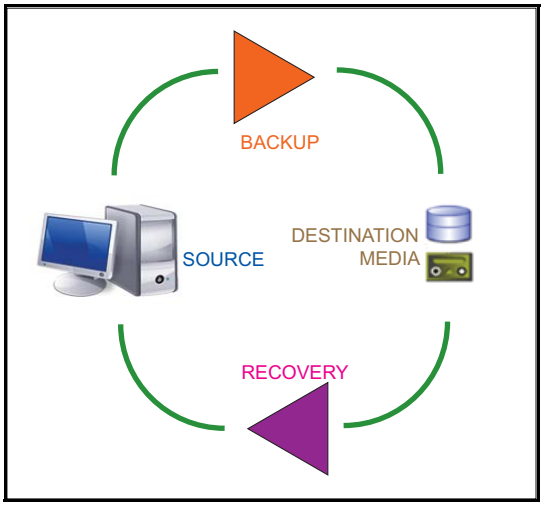

Figure 3: The Four Phases of Data Protection

Each successive data protection advancement addresses one or two of the four phases. The following table delineates the five generations of data protection:

The Five Generations of Data Protection			
Generation	**Features**	**Phases Primarily Impacted**	**Introduced (approx.)**
First Generation	• Disk-to-Tape		1980's
Second Generation	• SAN, Disk-to-Disk	Source and Destination Media	1997 - 2001
Third Generation	• Disk-to-Disk • Block-level incrementals } Windows	Backup	2003
Fourth Generation	• Disk-to-Disk • Block-level incrementals • Instant Availability • Bare Metal Recovery • Application Support } Windows	Recovery	2005
Fifth Generation	• Disk-to-Disk-to-Tape • Block-level incrementals • Instant Availability • Bare Metal Recovery • Application Support • Flexible storage } Windows and UNIX	Source and Destination Media	2007

The reasons for the emergence of each generation and its resultant technologies are concisely described in the sections that follow.

Generation 1. Disk-to-Tape.

Operators of unit record equipment and mainframe computers have used backup-to-tape for eons, or so it seems. Tape media was, and still is, inexpensive, scalable, and easily transportable for offsite vaulting. In the early years of computing, this was adequate insurance against the three primary potential computer catastrophes: natural disaster, hardware failure, and human error.

The rise of personal and mini-computers, followed by the establishment of Windows and UNIX platforms, and then by small computer networks, caused the following data protection dilemma: organized lights-out backups through the network were cumbersome if not impossible. This was solved by software agents that enabled heterogeneous sources to be backed up over the network to tape drives, and eventually to tape libraries and tape silos. One pioneer in backup software agents for non-mainframe heterogeneous networks was Backup Express from Syncsort. By allowing base/differential/incremental backup structures, Backup Express enabled system administrators to vary backup schemes depending upon data needs. That is, nodes that needed to be recovered quickly could be fully backed up each night, while those that did not have such urgency could be backed up using base/incremental or base/differential structures, which saved on tape costs and backup time but increased time and effort at recovery.

Generation 2. SAN, Disk-to-Disk (D2D).

As networks grew larger and organizations continued to use technology to economize resources, the following two problems became apparent: backup processing tied up LAN bandwidth, and job-allocated tape drives caused backup bottlenecks. The Storage Area Network (SAN) model – wherein multiple source servers are connected via a switch or bridge to one or more tape libraries – was developed. This freed LANs for other applications and, with the use of innovative technologies like Syncsort's SAN resource sharing utility, dynamically allocated tape drives among the SAN components.

Shortly thereafter, disk-to-disk backup emerged, facilitated by virtual tape library (VTL) technology. Disk-to-disk was administratively simpler and more cost-effective than tape backup. Disk-to-disk allowed efficient use of resource space on the storage medium, enabled direct random-access restores, and eliminated the complexities of tape-based recovery. But though the VTL model also provided for unsophisticated deduplication on the destination disks, this deduplication occurred after data transmission, so its impact on bandwidth and transmission speed was negligible.

Generation 3. D2D + Block-Level Incrementals (BLI) for Windows

LAN and backup bottlenecks had been abated by the emergence of SANs; and storage needs had been reduced dramatically with the combination of file-level incremental backups and chunk-level deduplication. Yet there were still many more variables to be simplified in the complex data protection equation.

It soon became evident that data transfers remained too slow and too large. As business user Service Level Agreements demanded more recovery points, a need to run nearly continuous backups arose. The major obstacle to optimizing RPO was an inability to back up frequently without impacting other operations.

The solution to the RPO conundrum was image-based, block-level data transfer technology, which first appeared for Windows operating systems. When a file, folder, disk, server, or more was routinely backed up, a block-level incremental (BLI) backup transferred only changed data blocks of changed files at the physical

level. The result was data transfers which were small in size and extremely swift when compared to file-level incrementals.

A further enhancement arose through Syncsort's innovative high-performance BLI, which accessed the changed blocks directly, bypassing the file system. The resultant small, non-intrusive data transfers eliminated the need for a backup window, consumed minimal bandwidth and CPU, and were very fast. Consequently, backups could be scheduled to run very frequently – nearly continuously.

History in the Making: Generations 4 and 5

BLI helped solve the issue of stringent RPOs by enabling frequent point-in-time backup snapshots without expensive mirroring or replication technologies. But recovery time, in some cases, was still too slow due to the time needed for reconstructing the image from the base and subsequent block-level incrementals, and for the data transfers themselves. The next data protection innovations addressed recovery time and crisis management.

Generation 4. D2D + BLI + Instant Availability (IA) + Bare Metal Recovery (BMR) for Windows

In 2005, a partnership between Syncsort and NetApp took block-level incrementals to a new level, by introducing the following revolutionary technologies:

Virtual Volume Snapshots. With this innovation, volume-level BLI transfers appeared on the destination appliance as base backup images. Figure 4 schematically illustrates the use of hourly block-level incrementals to form fully recoverable virtual volume snapshots.

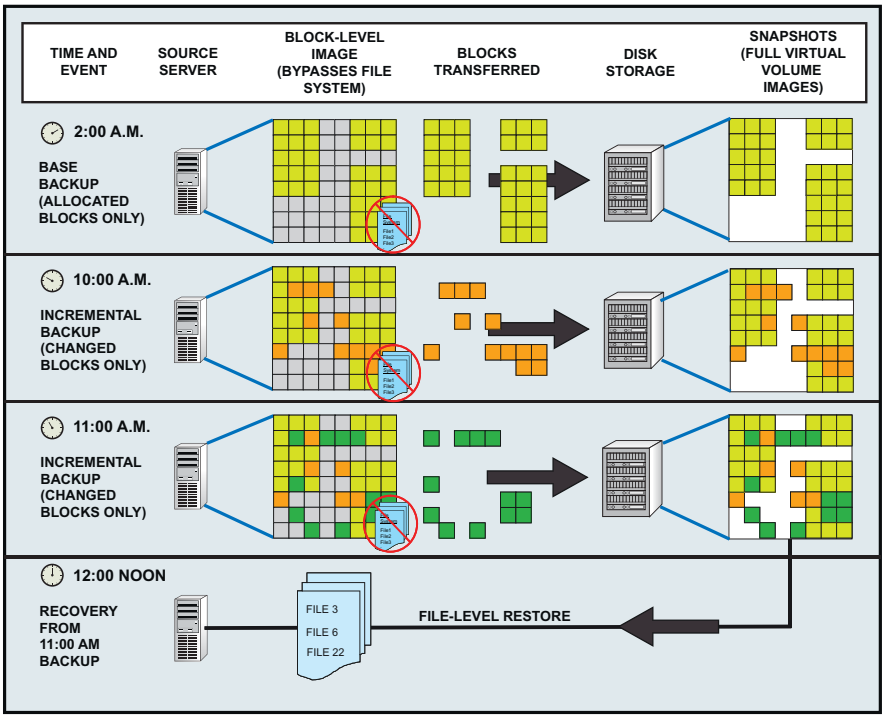

Figure 4. Block-Level Incremental Backups Produce Hourly Virtual Volume Snapshots

Through intricate snapshot technology on the destination host, each block-level incremental was immediately assimilated with previous volume backups as a virtual full volume snapshot. Hence, full volume snapshots were created on a nearly continuous basis with minimal additional disk space consumption.

Current and historic snapshots were immediately available for recovery, with no time wasted reconstructing the image at restore time.

In its earliest stage, the destination appliance for virtual volume snapshots was limited to NetApp filers.

BEX Instant Availability. Syncsort's innovative business continuance technology provided immediate recovery of critical applications and data without a need to transfer data. By rapidly initiating a read/write iSCSI mount to any virtual volume snapshot, users had live immediate access to file servers and applications. Thus users could temporarily resume business operations from the newly mounted drive. Instant Availability permitted mission-critical applications to be up and running in less than 60 seconds after a source disk failure.

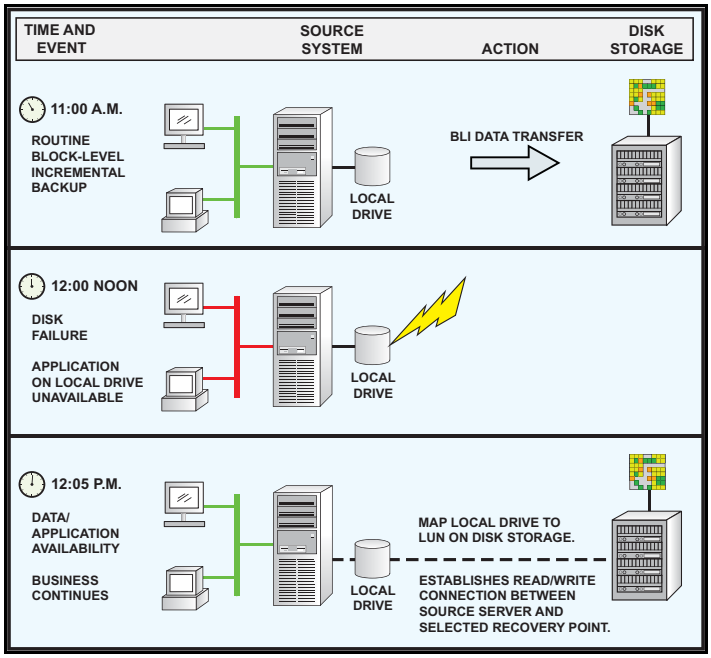

Figure 5: BEX Instant Availability Provides Rapid Temporary Access from a Source Node to Server Snapshots

Figure 5 illustrates the sequence of events that occur prior to Instant Availability. BLI snapshots are transferred to the destination server and, when a failure occurs, in moments a mapping from the source server to the correct LUN on the destination server provides full read/write access.

BEX Bare Metal Recovery. Syncsort's server recovery application was engineered to perform simple, extremely rapid bare metal recovery of source servers from backed up virtual volume snapshots. By utilizing non-intrusive, routine backups, BEX Bare Metal Recovery eliminated the need for special disaster recovery (DR) backup jobs. Because BEX Bare Metal Recovery is a block-level restore from disk, it is able to recover an entire or partial system, depending on needs, in mere minutes.

Robust Application Support. Applications such as Oracle, Microsoft Exchange, and Microsoft SQL Server were easily accommodated by the Generation 4 technologies. By using BEX Instant Availability and BEX Bare Metal Recovery, users of Oracle, Exchange, and SQL could be confident about business continuity and disaster recovery without loss of transaction processing.

Generation 5. BEX Advanced Recovery

Generation 4 closed the RPO and RTO gaps, and it provided a near-continuous data protection solution with comprehensive recovery and DR capabilities that met the requirements of nearly any mission-critical application. Generation 4, however, was limited to Windows sources and NetApp destinations.

The latest generation of data protection, Syncsort's BEX Advanced Recovery, expands source and destination options, bringing about enterprise design that meets an organization's precise needs. BEX Advanced Recovery provides everything from Generation 4 plus the following features:

UNIX backup and recovery. The latest innovation from Syncsort is the ability to back up UNIX servers, applications, and data with full non-intrusive BLI, virtual volume snapshots, BEX Instant Availability, and BEX Bare Metal Recovery. Currently, Sparc Solaris is supported, and in the near future other flavors of Linux and UNIX will be added.

Flexible storage options. With BEX Advanced Recovery, you can choose storage disk arrays that are precisely tailored to your needs. Depending upon the importance of the data or applications being backed up, you can choose high-quality, medium-grade, generic, or JBOD storage, or a combination. Advanced Recovery accomplishes this by supporting common Windows 2003 x64 servers as its destination host – even for UNIX sources – and allowing any direct, SAN, or iSCSI-attached disk array to be used for storage. A Windows 2003 device server used for this purpose is referred to as a **BEX Advanced Server**.

Disk-to-disk-to-tape. Known as BEX Archive, Syncsort's disk-to-disk-to-tape solution provides seamless additional backup from the disk-based BEX Advanced Server to tape. Later, if the data hosted on the Advanced Server is unavailable for any reason during recovery operations, the Advanced Recovery restore job automatically proceeds with recovery from tape to the original recovery destination.

The completely integrated Generation 5 topology combines Syncsort's BEX Advanced Recovery with multiple source servers and a variety of disk arrays. This robust topology is illustrated in Figure 6 below. Unique Advanced Recovery features are indicated in dark blue.

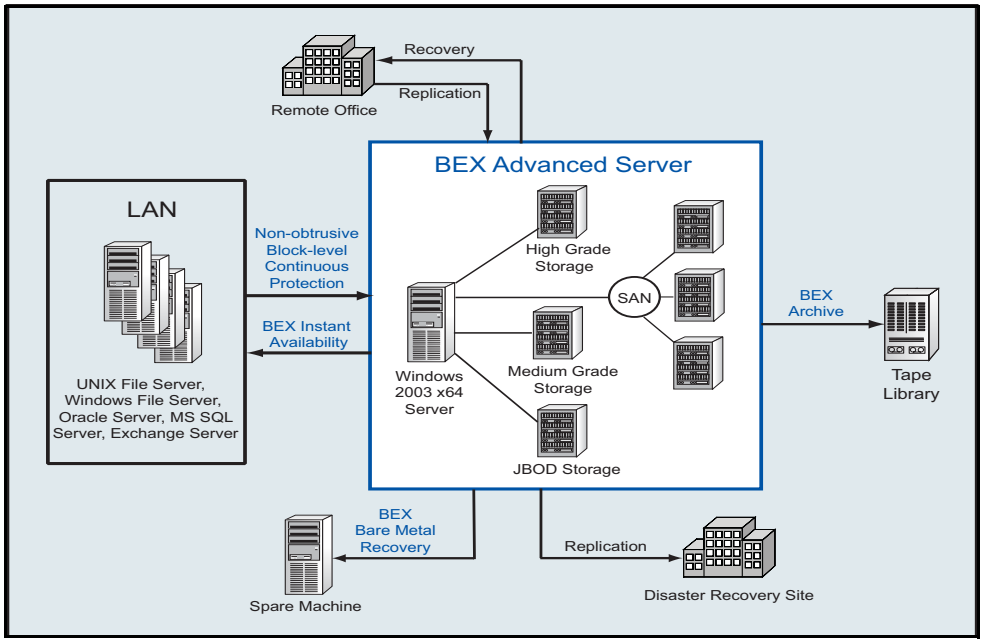

Figure 6. BEX Advanced Recovery: A Flexible Enterprise-Wide Data Protection Solution for Business Continuity and Disaster Recovery

BEX Advanced Recovery and Its Benefits

By now it is clear that ever-evolving data protection strategies are critical for business continuity, and that the data protection sector is responding to industry demands. Syncsort's enterprise-wide Advanced Recovery solution offers a solid and fully integrated fifth generation data protection model that meets all your needs in a single package. BEX Advanced Recovery provides the following benefits:

Continuity of business. Unique BEX Instant Availability technologies enable instant recovery of critical applications and data without a time-consuming data transfer. If a drive fails, simply map to a LUN on the BEX Advanced Server, and the stored snapshot immediately becomes a live application. BEX Instant Availability provides near-instant access to recovery points for SQL Server, Exchange, and Oracle applications.

Immediate recovery to any one of multiple points in time. Recovery to past points in time is easily achieved through simple selection of one of the many virtual volume snapshots on the BEX Advanced Server. This capability helps satisfy many SLA and regulatory requirements, and plays a key role toward protection against data corruption.

Near-continuous backup. By deploying image-based, non-intrusive, block-level incremental backups, data transfers are extremely swift, require no backup window, and consume minimal bandwidth and CPU. Consequently, backups can be scheduled to run very frequently – nearly continuously.

Fast and simple disaster recovery. BEX Bare Metal Recovery, disk-to-disk server restoration based on native Advanced Recovery backups, enables entire servers, including settings, applications, and patches to be fully-restored in minutes after a server failure, instead of in hours.

Source server flexibility. BEX Advanced Recovery provides the rare ability to protect both Windows and UNIX servers, applications, and data with full non-intrusive BLI, virtual volume snapshots, Instant Availability, and BEX Bare Metal Recovery capabilities and benefits. Currently, 32 or 64-bit Windows and Sparc Solaris are supported, and in the near future other flavors of UNIX and Linux will be added.

Disk flexibility. With BEX Advanced Recovery, you can choose storage disk arrays that are precisely tailored to your needs. Depending on the importance of the data or applications being backed up, you can choose high-quality, medium-grade, generic, or JBOD storage, or a combination. And you are not tied to any specific disk manufacturer.

Resource efficiency. BLI with virtual volume snapshot technology requires very little additional disk space for each successive backup, minimizing the frequency of additional disk purchases. And because disk-based destination storage is declining in price and is easily expandable, the BEX Advanced Recovery solution provides for scalability on demand.

Enterprise-wide coverage. The BEX Advanced Recovery solution economically supports not only critical applications, but resources at all levels: file, folder, disk, server, and site. Advanced Recovery file transfers serve as routine file backups, disaster recovery backups, and everything in between. The single data protection package also economizes knowledge resources since IT personnel need to become familiar with only one product.

Long-term data retention. BEX Archive provides additional long-term data retention with minimal setup and configuration overhead. In the event an Advanced Recovery restore operation is interrupted, automated failover from tape is initiated.

Oracle Cloning. The Instant Availability feature of BEX Advanced Recovery makes virtual cloning of Oracle databases possible by providing immediate access to the latest or any past database snapshot on the BEX Advanced Server. Thus an Oracle DBA can quickly generate multiple read/write virtual clones of an Oracle database from any stored point-in-time snapshot, while utilizing little more storage than the database image on the destination disk.

Central and remote site recovery. Fast and small data transfers and disk-to-disk bare metal recovery assure that both central and remote sites are fully and reliably protected. BEX Replication to an alternate BEX Advanced Server at a distant site, is easily accommodated across even a slow WAN. Data and applications at remote offices are replicated to central headquarters, and those at central headquarters are replicated to a secure disaster recovery site.

Additional benefits. In addition to the major benefits described above, Syncsort's BEX Advanced Recovery solution features administrative simplicity, a centralized data protection approach that retains local control for simple file restores, multiple platform support by means of a single interface, and support for failover clusters, applications, distributed storage, and dynamic resource allocation.

Conclusion

Syncsort's BEX Advanced Recovery is a unique software solution for enterprise disaster recovery and business continuity of UNIX and Windows systems. The Advanced Recovery component of Syncsort’s Backup Express is engineered to meet the demands of today’s SLAs for tight RTOs and RPOs.

The unique capabilities of Backup Express with Advanced Recovery – including bare metal recovery in minutes; archiving to tape; near instant access to SQL, Exchange, and Oracle images; easy recovery to multiple points in time; and powerful Oracle cloning – are fully integrated with a robust enterprise data protection system. In addition, BEX Advanced Recovery combines near-continuous data protection with complete flexibility in terms of disk storage – allowing users to match storage needs with storage quality, recovery speed, and data availability.

By responding to the needs of business users world-wide, Syncsort has been a leading innovator of software solutions for over 40 years, and has been on the leading edge of data protection for heterogeneous networks since 1994.

BEX Advanced Recovery provides a high-value data protection solution that enables administrators to dependably meet their business users' continuity and disaster recovery requirements in all information-related disaster scenarios. For further details about Syncsort’s data protection solutions, visit http://www.syncsort.com/products/bex/home.htm.

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