



# Advanced Recovery Solutions

Reducing the Time to Recover;  
Improving the Currency of Data



A TECHNOLOGY SERVICES COMPANY

# Advanced Recovery Solutions

## Executive Summary

What would be the impact to your business if your technology systems were unavailable for 24 hours? When the systems were finally brought online, how current would your data be? When was your last backup performed? Were all the tapes stored safely off-site? And what about the backlog of data that was generated during that 24-hour period of your outage? How long would it take to enter the data manually when the systems came back online? What are your Recovery Time Objectives (how long an outage can your business tolerate)? What are your Recovery Point Objectives (how current does the restored data need to be)?

Given the threats your organization faces and your requirements to remain operational, could your business survive?

An increasing number of organizations are asking these questions and are surprised by the answers. Until the lost and backlogged data is recovered and synchronized and each nightly processing cycle has occurred, it is unlikely that systems can be turned over to the users and daily production can resume. The reality may be that the recovery timeline for just one 24-hour outage could be a full week or more, and any data generated between the last backup and the outage may be lost completely.

As the dependence on technology increases, and all areas of the enterprise are electronically interfacing, a company's ability to function during and after a 24-hour outage is at significant risk. In today's environment, a traditional recovery program, in many cases, does not achieve the Recovery Time or Recovery Point Objectives that a corporation realistically requires to remain operational.

Comdisco has been working for over 10 years to develop and implement solutions utilizing advanced technologies and processes that enable companies to reduce the amount of time it takes to restore systems and eliminate the exposure of lost transactions. Support for these solutions has grown from a mainframe-only environment to midrange and distributed systems and servers in a networked environment requiring the synchronization of all data. The effort was initially driven by major money center banks, but now includes other industries such as: pharmaceuticals, insurance, transportation, manufacturing, government and all areas of financial services. Advanced recovery solutions are more critical than ever, as organizations using large, integrated application suites may need more capability than the traditional recovery process offers.

Key considerations in understanding the business impact of a disruption and implementing an effective business continuity solution are as follows:

1. Realistically assess your current capability and business impact and the options available to ensure the recovery program meets its objectives.

2. Design a recovery solution to adequately address the Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) as well as financial goals.
3. Prior to implementation, validate the solution (where possible) to assure technical feasibility, financial performance and production impact.
4. Implement the solution in an effective and timely manner, considering a phased approach to minimize complexity and maximize effectiveness.

### Why are customers implementing Advanced Recovery Solutions?

The only thing changing faster than the technology itself is businesses' reliance upon it. Historically, companies have invested in technology to reduce paperwork, improve efficiency, and lower costs. As business functions have become more automated, the technology itself has become a big part of delivering service.

With the scope of automation today, however, no manual system could possibly recreate and support the flow of information in a normal business day, let alone in a disaster. This has been a major driver of advanced recovery solutions.

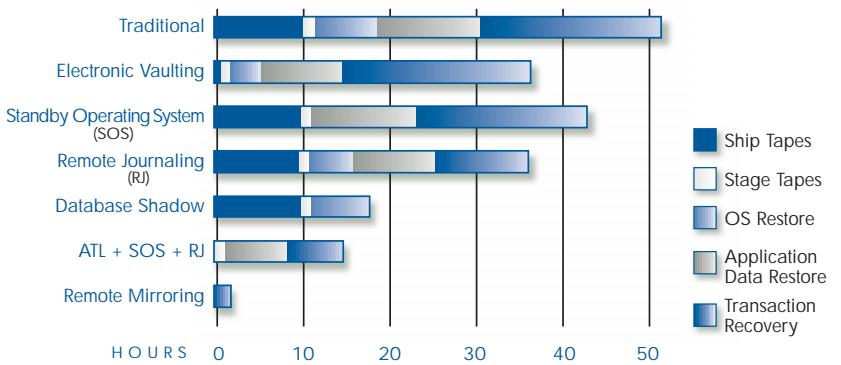
Organizations are extremely vulnerable to a system outage or other business interruption. Factors such as customer demand, regulatory controls, immediate financial loss and lost opportunity are motivating companies to improve their recovery processes.

The first step in determining the actions required to improve recovery is understanding your current recovery timeline. Take a hard look at the realistic timeframes for the components of the recovery timeline.

The universal recovery time components include: declaration decision, transporting backups and personnel to the recovery location, system restore process, system start up, application data restore, application recovery, network recovery and application data re-entry. When looking for improvements, tackle a recovery component that will have the greatest impact on your recovery objectives.

### Timeline Impacts

Sample impacts of Advanced Recovery Solutions to the traditional timeline.



### Advanced Recovery Technologies

#### Electronic Vault - Remote Tape Library

If your recovery location is not in close proximity to your home site or the backup volumes number more than a few thousand, a substantial reduction in recovery time can be achieved with remote vaulting of tape-based data to an automated tape library. A remote tape library for electronic vaulting requires a production system connection to a tape library complex located off-site via channel extension. The remote tape library can be in one of two locations. One option is to co-

locate the remote library with the recovery capability and directly connect to the recovery processor. This option requires dedicated space at the recovery location but allows for the swiftest recovery because local connection time is minimized and transmission speed is maximized. A second option is to house the remote tape library in another internal location, perhaps a second production site connected to the recovery processor via the same channel extension technique that is used for the remote production capability. Installing the remote tape library closer to home will reduce the data transmission rate but will extend the recovery time compared to a locally attached library. Although the reduction in recovery time in eliminating transportation and staging and reducing mount time is obvious, vaulting to a tape library also aids with the recovery point by positioning backups off-site immediately, not hours later when the off-site storage delivery service arrives.

If journal/log archives are written to the remote tape library, the point of recovery is improved to the last log/journal archive for each application. However, these times will likely be very different, complicating data synchronization.

### Electronic Vault – File Level

Another method of electronic vaulting is to utilize software to capture specific files on an as-needed basis and bulk data transferring them to the remote location. The components of file-level electronic vaulting

are software and processor capability at both the send and receive ends, a

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communications connection between the two processors, and tape or disk to maintain the remote copy of the data. The benefit is the ability to have more frequent backups of specific files available off-site.

Additional data can be electronically vaulted, resulting in an improved recovery point. Logs and journals can be vaulted, for example. Even file updates can be captured and sent to the remote vault. These procedures will have positive effects on recovery, although they must be balanced with the additional cost in IS

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personnel time to maintain procedures and monitor data transmissions.

### Standby Operating System

The restore and recovery of the operating system is the most basic recovery step. The repetitiveness of this process is a nuisance to those managers trying to best utilize resources and personnel to support a widening scope of recovery

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testing objectives. Maintaining a copy of the customer specific system on disk directly attachable to the recovery processor provides the ability to bring systems up immediately at time of test or disaster. The components of a standby operating system are weekly backups of the system used for production, a method of transporting the backups (via overnight delivery or

electronically) and a weekly restore. Optionally, electronic vaulting at the file level can be used to maintain some critical files at a more recent point in time. The standby operating system solution is best used in conjunction with other options, such as standby database, otherwise the system is up and available in time to wait for other resources to continue with the recovery. The standby operating system can also include critical components required by other advanced recovery solutions, such as necessary tape library software or systems files.

### Remote Journaling

If the main focus for improving recovery is on the recovery point rather than the recovery time, the first stop in your search for a more robust recovery should be remote journaling. Remote journaling entails intercepting the writes to a local log or journal and transmitting a copy of those writes off-site in real time mode, providing for recovery to a point extremely close to the point of failure. The components of a

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remote journaling solution are a local application that creates local logs or

journals, software to intercept and transport the writes to a remote location, and software to be used at time of test or disaster to apply the remote updates to the last valid backup data. When determining the impact of remote journaling to your recovery timeline, don't be surprised if your perceived recovery time gets longer. The normal practice in recovery exercises is to restore application data and ensure the application

starts. Very rarely do organizations commit time to practicing the re-entry of previously entered and accepted transactions. Practicing re-entry of transactions is a key component in ensuring viability of the organization's Recovery Time Objectives and should be included in tests and all recovery time frames. Utilizing remote copies of the journals and using software procedures for recovery is exponentially faster than manual re-entry. Therefore, in a *complete* recovery, the time to recover will be significantly reduced.

### Database Shadowing

Database shadowing is the combination of a point in time copy of your database on disk (standby database), remote journaling and the regular interval application of the log/journal updates to the database. The components are the same

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as remote journaling with added dedicated disk, provisions for periodic restores and regular application of transaction data to update the database. Database shadowing is a flexible option for managing to a specific Recovery Time Objective for an application. To meet shorter Recovery Time Objectives, apply the updates on a more frequent basis.

### Remote Mirroring

Remote mirroring is one of the hottest topics in advanced recovery today. With this solution, another copy of your data is maintained at a remote location. Organizations with the most to gain from remote mirroring are those companies that can easily segregate critical applications for mirroring and recovery, or

those companies whose applications are critical enough to warrant the added expense of remote mirroring for the entire enterprise.

There are two methods to achieve remote mirroring, a software solution or a hardware/micro-code solution. In both cases, updates to protected volumes are intercepted and synchronously, semi-

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The benefit of locating remote disk close to the production center is to minimize the impact on production performance and reduce the cost of connectivity. The benefit of locating remote disk with the recovery processor is to minimize recovery time. One major advantage that hardware mirroring has over other advanced recovery techniques is that a single solution can protect several platforms and any data type that can be stored on disk. The impact on IS personnel, in managing a single solution versus many different solutions, needs to be calculated and included in the overall solution cost.

**System Replication**

System replication is simply the capability to provide a continuous operating environment by duplicating systems, data and network at a remote location. The

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necessary to accomplish production processing, replication of

systems software, potentially remote mirroring of disk as described above, and a network between the two sites to keep them in sync. Automatic system takeover is possible for the greatest protection capability. System replication, when available, is the most comprehensive solution for addressing Recovery Point and Recovery Time Objectives.

**Hot Network Node**

In any recovery situation, users need access to their data. One way of preparing for this connection of recovery data to the production network is to locate a hot production node in the same location as the recovery capability. The benefit of having a hot network node is that it is

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continually monitored and in use, thereby minimizing failure potential. Also, by incorporating recovery in your production network, data already travels through the recovery location. Establishing network communications at time of disaster can be complex and time consuming; pre-staging of the configuration eliminates error and excess recovery time impact. Circuits into the hot node can also be leveraged to support data transmission for other advanced recovery solutions.

**Real Life Examples**

Once the traditional and advanced recovery options are understood, the challenge is to create a solution that meets or exceeds the corporate objectives, maximizing recovery potential while balancing application criticality with program expense.

The following outlines how two companies maximized the business benefits of technology to advance their recovery capability. It is important to note that the significant recovery program improvements are due to the combination of tools, technology and process that each organization employs.

### **Reducing the Recovery Time**

The first company, in the financial services industry, is a mainframe-dependent organization. In 1991, they recognized the need to protect their online transactions and implemented remote journaling. The recovery timeline could be estimated at about 28 hours, based on recovery test experience. In order to reduce the recovery time, the company added a remote tape library co-located with their Comdisco hot site. This combined solution enabled the company to demonstrate a 16-hour recovery with zero data loss for their critical application.

As the technology improved, so did the solution. In 1995, the remote tape library hardware and connectivity into the hot site was upgraded to reduce the recovery time another 8 hours, resulting in an 8-hour recovery. As a result of a recent merger, the company migrated their existing data center to a new location. This migration was achieved using hardware remote mirroring technology. The experience with mirroring was so positive that the company is now seriously considering implementation of remote mirroring technology to protect all their data, not just their databases. It is also expected to result in a much faster recovery time, about 2 hours.

### **Improving the Recovery Point**

The second organization, a major bank, got in on the ground floor of advanced recovery solutions. In 1988, they were one of the first organizations to protect their critical online transactions with remote journaling software. They also had a standby operating system in place and were able to verify a weekly IPL of the operating system. A hot network node is co-located with the dedicated and hot site recovery resources. The network node serves as the bridge between all the production sites, the advanced recovery capability, and the shared risk hot site capability.

As the years progressed, they added applications to remote journaling. In order to reduce their recovery timeline, they protected critical databases by file level electronic vaulting to dedicated disk. The journal/log updates were also processed throughout the day to prepare the data to be applied quickly to the databases. Comdisco created and validated procedures for recovery of their most critical application. The recovery was performed by Comdisco in a dedicated LPAR to ensure the 4-hour recovery timeline could be met. This process was exercised on at least a quarterly basis. This customer has a wide array of computing technologies and although the critical mainframe applications leverage advanced recovery technologies, large portions of the enterprise still rely on traditional recovery methods.

In 1992, the company implemented database shadowing on a dedicated Tandem processor. The Tandem recovery capability is connected to rest of the production world via the hot network node. In 1994,

the company added dedicated mainframe processing to handle their increasing CPU requirements. In 1996, they added a remote tape library complex. The remote tape library complex is able to be accessed by two production locations, the Comdisco advanced recovery processor and the hot site capability, simultaneously. The company's Digital recovery utilizes database shadowing to a dedicated internal facility.

The end result is that the organization can recover critical applications within 4 hours and they have a tiered approach for the rest of their applications. Each location can recover within stated objectives and tie into the remaining production environments. As the company continues to broaden their view of recovery, the next hurdles are the recovery of hundreds of servers, remote mirroring and virtual tape.

The two companies profiled have significant management and budgetary commitment. The approaches profiled can be implemented on a limited scale to achieve specific objectives. Most companies will focus on addressing key concerns with a limited approach and then expand their capability over time.

### Select a Partner for Long Term Success

Comdisco is the most experienced advanced recovery provider in the industry. There have been over 20 declared disasters utilizing an advanced recovery capability, all of which recovered successfully, meeting all required objectives. In some of those recoveries, Comdisco provided critical data that was inadvertently deleted at customers' production locations. This is data that would have been *lost* without the advanced recovery solution in place.

By working closely with customers and other vendors, Comdisco has established itself as the most knowledgeable independent provider of integrated recovery solutions. Our recovery professionals have worked on all phases of the process of improving recovery; assessment of the current situation, design of the recovery solutions, validation of the technology alternatives and implementation of an integrated solution.

### Comdisco at a Glance

*Comdisco is a \$2.9 billion technology services company and a leading provider of solutions that help organizations reduce technology cost and risk. These services include asset management, business continuity, equipment leasing and remarketing, network services and Year 2000 testing.*



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