Virtually every business has developed some kind of plan for backing up the terabytes of data that reside in applications, systems and databases. But in the quest to manage information effectively, it’s also clear that too many organizations take a mix-and-match approach. The end result is systems and processes that are overly complex, lack speed and efficiency, increase the risk of failure and wind up breaking the budget.

Today, data storage and backup demands are growing at a 50 percent annual clip. A complex array of options and possibilities now confront IT managers, administrators and executives. While tape backups still handle a heavy load — particularly for disaster recovery — options such as virtual tape libraries, emulation of tape drives, distributed disk-to-tape (D2T), disk-to-disk-to tape (D2D2T) and other methods are gaining favor.

Understanding the nuances of backup, recovery and archiving can determine whether a business hits the mark or winds up with a black mark. It’s essential to examine backup windows, recovery time objectives (RTOs), recovery point objectives (RPOs), decentralization of data and overcall costs. “Building an integrated approach requires insight and oversight,” says Shawn McIntosh, a senior manager at Atlanta-based consulting firm AGSI.

Forward, Backing Up

For years, organizations have used tape systems to back up data. Devices from the likes of Imation, Quantum and others have evolved into a mainstream way to manage backups, recovery and archiving — and they’re well suited to handle disaster recovery and offsite backups in an efficient and cost-effective way. In fact, many tape libraries now use robotic automation to enable hands-off backup operations.

Yet, as systems and network grow more sophisticated, tape is giving way to more advanced methods. One of the biggest problems with tape centers is data bottlenecks. Too often, the best-designed processes and procedures fray because systems can’t keep up with the demands of a data intensive environment. “A system that’s too slow or unable to manage data efficiently can create significant problems,” McIntosh explains. “It can compromise data internally but also ripple outward to business partners and end customers.”

Building an effective data management environment requires up-front analysis and a thorough inventory of existing systems. There’s no shortage of possible approaches and every organization has distinctly different needs. A business must also pay attention to industry regulations and compliance requirements, such as Sarbanes-Oxley.
or the Health Insurance Portability and Accountability Act (HIPAA). These can determine how data is stored.

Still, it’s important to determine up front whether data should be backed up or archived. Backups are generally copies of active or important production data that an IT department can restore. Most backups are designed for short-term use and are frequently overwritten. Archives, on the other hand, typically contain static data, such as e-mail, document files or old and inactive transactional records. Oftentimes, as data ages it’s moved to an archive to save disk space and simplify data administration.

Although many organizations rely on tape, CD or DVD-based solutions to store data, technology is continuing to evolve. Dedicated devices are beginning to make their mark. For example, the Imation ComplianceVault Email Archiving Appliance continuously indexes and archives an unlimited number of mailboxes using almost any IMAP/POP3-based e-mail system. It offers disk capacity as high as 800GB and offers tape storage options. The Veritas TrustWorthy Mailbox Archiving Appliance also offers advanced e-mail archiving capabilities.

Specialized systems are also changing the way organizations archive enterprise data. Active online archiving boosts performance and availability of mission-critical applications by removing historical data from production and placing it in an “active” archive. Users can browse and selectively restore this “active reference data” as needed. This approach can reduce or delay expensive hardware and software upgrades.

The challenge for any organization is to determine the specific mix of backup, recovery and archiving tools that work best and integrate various systems to maximize data protection and minimize IT time and expense. “It’s important to understand the value of data and, in many cases, the value for different data elements,” observes McIntosh. “Too often, organizations over-buy, under-buy or simply don’t match the technology to their needs.”

**Driving Results**

It’s no longer acceptable to adopt a one-size-fits-all approach to data backup, archiving and restoration. Technology consulting firm META Group estimates that large organizations can lose upwards of $1 million an hour when critical systems and data aren’t available. Stephanie Balaouras, a senior analyst for enterprise computing and networking at the research firm Yankee Group, states that organizations that embrace an effective data management strategy move from a “reactive mode to a proactive mode. They’re able to conduct business far more effectively.”

Today, many businesses are turning to disk-based systems that complement or replace tape. In many instances, these systems provide high availability as well as effective data-and-disaster recovery. In addition, manufacturers have introduced affordable Advanced Technology Attachment (ATA) and Serial Advanced Technology Attachment (SATA) drives that offer improved reliability and performance — as well as a high level of compatibility with existing software. Whereas a few years ago the cost of disk-based storage was about 10 times the price per gigabyte of tape media, disks now run about twice the price of tape but total cost of ownership (TCO) is rapidly tilting in favor of disk storage.

Disk-to-disk systems also simplify synthetic backups — which typically involve a full backup followed by incremental backups. This approach uses fewer resources and less bandwidth than tape-based methods. Moreover, disks — while susceptible to errors and crashes — are more resilient and less prone to wear and tear that eventually forces an organization to replace tape storage. Finally, if a single cartridge fails during a restore operation, IT can spend hours getting things back on track. Unlike tape, files stored on disk are accessible instantly, even during a full synthetic backup. EMC, Exabyte, Hitachi, Legato, Network Appliance, Snap, StorageTek, Tivoli and VERITAS are among the leading providers of disk-based backup and recovery systems.

**New Strategies Gain Favor**

Organizations are also turning to a hybrid D2D2T approach. It transfers data from one disk-based system to another on an hourly, daily or weekly basis but eventually transfers the data

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### Storage Technologies at a Glance

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<tr>
<th>Technology:</th>
<th>How It’s Used:</th>
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<tr>
<td>Tape Backup</td>
<td>The most basic and inexpensive approach for backing up and archiving data. In most cases, organizations move data from disk to tape.</td>
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<tr>
<td>Disk-to-Disk (D2D)</td>
<td>Hardware and software that move data from PCs or centralized databases to another disk-based system. This makes the data highly accessible.</td>
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<tr>
<td>Disk-to-Disk-to-Tape (D2D2T)</td>
<td>A data backup-and-recovery method that uses disk technology as an intermediary step before archiving the data to tape.</td>
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<td>Tape Emulation</td>
<td>A disk-based data recovery solution that emulates a tape device.</td>
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<tr>
<td>Replication-Based Backup and Recovery</td>
<td>Software that copies changed data or data residing on central storage over an IP network. The organization can then back up centralized data to a tape system for archival purposes.</td>
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<tr>
<td>Point-in-Time Copy</td>
<td>A physical or virtual copy of data stored on a disk. The data is typically used as a read-only copy for data recovery purposes.</td>
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to a tape system for offsite backup. This approach ensures that recent data is accessible and it keeps data sets smaller — thus speeding transfers in either direction. “It allows an organization to do some dynamic caching and bring information back in near real time,” McIntosh explains.

Tape emulation is another approach that’s gaining favor. It uses hardware or software to make a disk-based system appear like a tape library to backup software. An advantage of this approach is that it’s usually seamless to deploy and use because it doesn’t require any changes to underlying processes. In most cases, tape emulation is easier and less expensive to manage while offering performance improvements over straight backup to disk. That’s because it avoids disk fragmentation that usually occurs in disk-based environments. Another advantage to tape emulation is that it speeds access to production data because it can complete backups more quickly.

Still another approach is point-in-time copy. It is particularly effective for firms with extremely tight backup windows. That’s because point-in-time copy generates a snapshot or mirror of data, which an organization can split up and store on disks as needed. An index keeps track of where the protected data exists on all the various storage arrays. This makes it possible for an IT administrator to roll back a system to a specific point in time — and break recovery points down to four- or six-hour intervals.

Finally, there’s replication-based backup. It too takes a snapshot of an environment but it handles the task on an ongoing basis — either synchronously or asynchronously among storage arrays — rather than transferring to tape once or twice a day. This technique drastically reduces the need for tapes and slashes bandwidth and processing requirements. In addition, an organization can strengthen its disaster recovery strategy by storing the replicated data at a remote site. Ultimately, it provides powerful recovery point and recovery time capabilities.

A Positive Spin

Ultimately, all backup, archiving and recovery tools lead in the same general direction. “The business needs must drive the strategy,” McIntosh points out. “It’s important to know how much data to retain, how to store it and how to retrieve it at some point in the future. When an organization understands what data it must retain and how accessible the data must be at any given moment, it can make smart decisions about the technology and maximize its return on investment.”

To be sure, businesses that develop a solid backup, recovery and archiving strategy — especially within the context of business continuity — can begin to address the uncertainty and unpredictability of today’s world. They’re in a position to transform the challenging world of data management into a competitive advantage and protect their data in good times and bad.

• Analyze applications and data requirements. The first step in devising an effective strategy is to understand which applications pose challenges or potential problems. By addressing these issues at the start — and basing a strategy on the business case — it’s possible to develop a backup, recovery and archiving strategy that’s flexible and efficient.

• Examine the data. Too often, static data winds up residing in backup systems — hogging storage space and bandwidth. A thorough examination of various data elements provides insights into how an organization can move data into an active archive.

• Pay attention to time frames. In addition to internal and general legal requirements, Sarbanes-Oxley, HIPAA and other regulatory statutes mandate that an organization keeps data for specified periods. Ensuring that it’s accessible is essential.

• Know how much downtime is acceptable. Not all data is created equal. In some cases, it’s important to have data back online within minutes, in other cases hours or days will suffice. Designing systems effectively is the key to managing costs and achieving a solid ROI.

• Conduct a risk-return analysis. It’s easy to wind up with legacy systems that become outdated and inflexible. It’s also all too easy to overspend and deploy an overly complex system when a more basic technology is adequate. It’s important to examine up-front overall technology costs, media costs, offsite placement expenses and potential upgrades.