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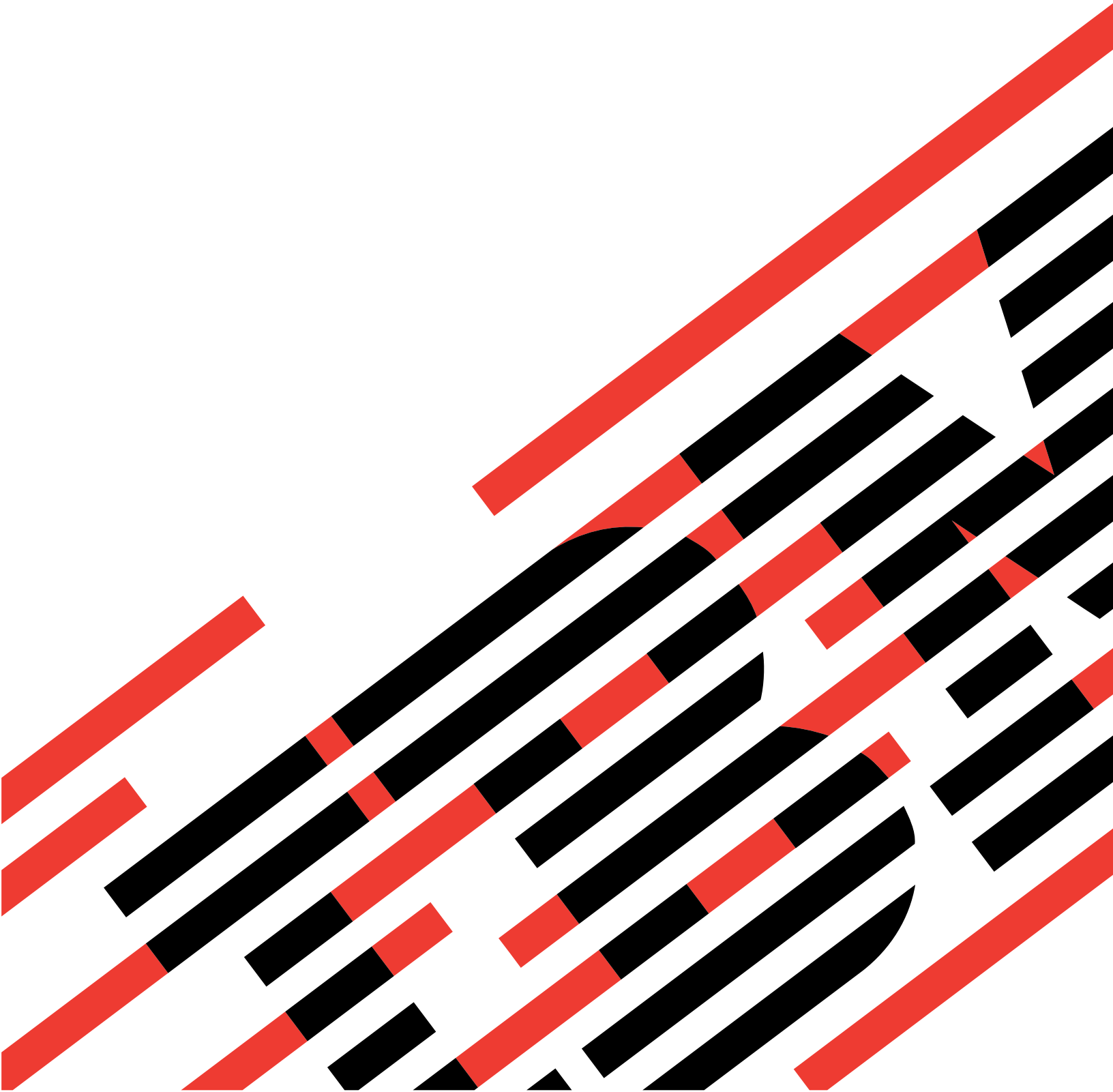
Storage solutions



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Storage solutions

Contents

Storage solutions

As your company produces a greater volume of information, and as the value of that information grows, the methods you use to protect and preserve it become vital corporate strategies. Storage has gone from being a feature of a server to being an entity unto itself. It performs several valuable functions within your enterprise, including the following:

- **Availability.** Your storage solution must enable you to access your data when you need it, without exception. In some settings, such as a hospital, access to data can mean the difference between life and death.
- **Integrity.** Your data must be in exactly the same condition when it returns to you as it was when it was stored. That means it must be safe from corruption, loss, and outside attack.
- **Recoverability.** Your storage solution should ensure that you can recover your data in the event of a natural disaster, such as a fire, flood, or tornado.

The purpose of this topic is to step you through the world of iSeries storage and help you make choices about which storage technologies are right for your company now, and which may be useful in the future. The topics in this section include the following:

How the iSeries views storage
This topic describes how objects are stored on your iSeries server and lays the groundwork for the other topics in this section.

Disk
This topic describes how disk storage on the iSeries works and describes how it can be configured and used for different storage purposes.

Tape
This topic describes the advantages and limitations of using tape for storage. It also makes some recommendations about when tape is a good choice and when you should consider other media.

Optical
This topic provides an overview of optical on the iSeries server. It discusses the advantages and disadvantages of using optical as a storage media and makes recommendations for when optical could be the media of choice.

Storage area networks
This topic describes what storage area networks are and how they can be used to provide centralized storage. It discusses advantages and disadvantages and links you to more detailed information.

For additional information that is specific to storage for backup and recovery purposes, see Getting your media ready to save your server.

For detailed information on the storage components described in this topic, see IBM Total Storage

.

What's new for V5R2

The entire Storage solutions topic is new for V5R2. Its purpose is to describe iSeries storage options and show you where you can find more information about them.

Print this topic

To view or download the PDF version, select Storage solutions (about 87 KB or 14 pages).

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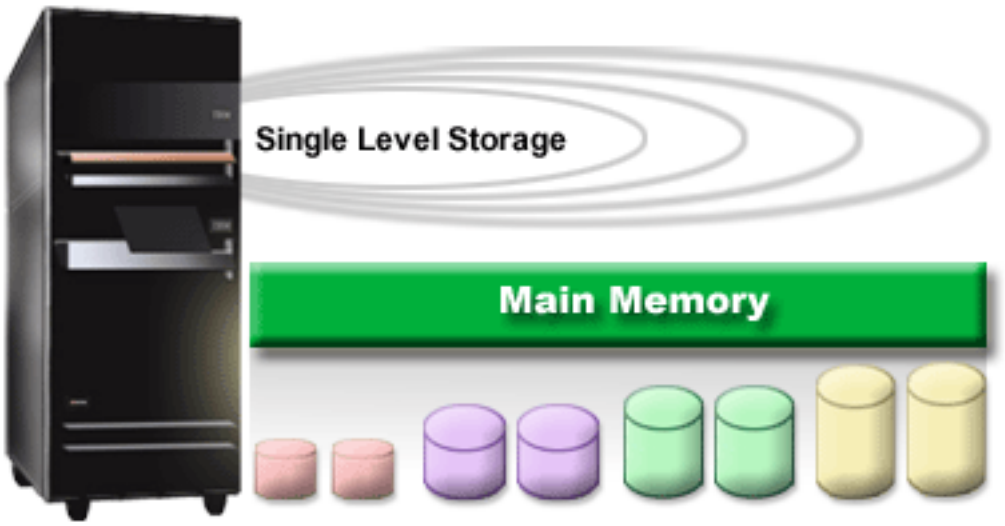
How the iSeries views storage

The iSeries server has a unique way of addressing storage. It views the disk space on your server and your server's main memory as one large storage area. This way of addressing storage is known as **single-level storage**. The following diagram shows how single-level storage works:

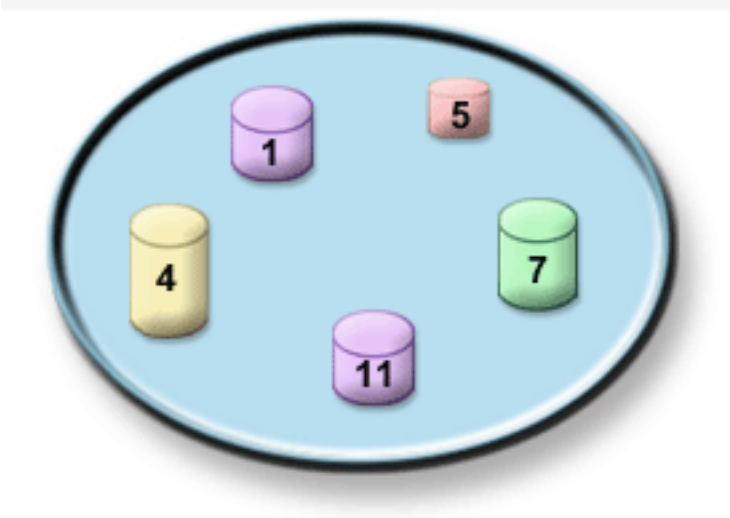


When you save a file, you do not assign it to a storage location; instead, the server places the file in the location that ensures the best performance. It may spread the data in the file across multiple disk units, if that is the best option. When you add more records to the file, the system assigns additional space on one or more disk units.

Disk

Disk storage is the storage that is usually internal to your iSeries server; however, it can also be attached externally to it. You can group your disk drives into logical subsets called **disk pools** (also known as auxiliary storage pools or ASPs). One reason to do this is to provide a level of protection for your data. If one disk unit fails, you only have to recover the data stored in the disk pool that the failed disk unit was a part of.

Disk pools also enable you to set disk space aside for a particular purpose, application, or data type. For example, you may create a disk pool for backups done to save files. You can then move these save files to tape or other media when it is convenient for you. The following diagram shows a disk pool that is composed of disk units 1, 4, 5, 7, and 11.



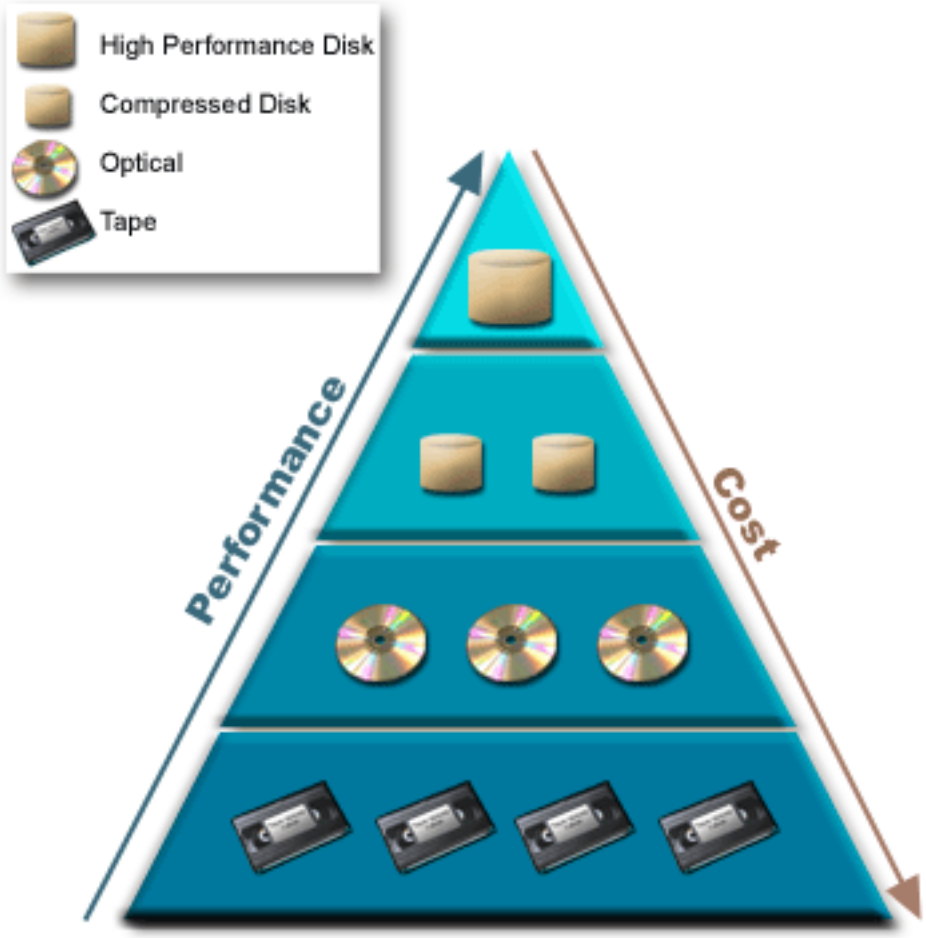
For detailed information on disk pools, disk pool types, and examples of how to use disk pools for different purposes, see Disk pools. For information on how to configure disk units and disk pools, see Manage disks and disk pools.

Independent disk pools are disk pools that can be brought online or taken offline without any dependencies on the rest of the storage on a system. This is possible because all of the necessary system information associated with the independent disk pool is contained within the independent disk pool. Independent disk pools offer a number of availability and performance advantages in both single and multiple system environments. For detailed information, see Independent disk pools.

Besides disk pools, there are a few other ways to protect your disk units and the data on them. **Mirrored protection** protects your data by keeping a copy of the data on two separate disk units. When a disk-related component fails, the system may continue to operate without interruption by using the mirrored copy of the data until the failed component is repaired. **Device parity protection** is a hardware function that enables your server to reconstruct data in the event of a disk failure. It is important to remember that these disk protection methods are not a guarantee against failure or data loss. You still need to have a good backup and recovery strategy in place in order to truly protect your data. For detailed information on the disk protection methods described here, see Disk protection.

Compared to tape or optical, disk is a more expensive storage option. However, the data on disk is more quickly accessible than on tape or optical. It is important to balance the cost of storing data on disk with the speed and convenience with which you can access that data. For example, if you have older data that you access infrequently, you may want to consider storing it on tape or optical, rather than on disk. Likewise, current information that you access frequently would be worth the cost of disk storage because

you could access it quickly. This type of storage strategy is called **hierarchical storage management**. The following diagram shows the different layers of hierarchical storage management:



It is not always the same data that resides in the high performance storage components. Data is moved among the different layers according to the current system needs. The key to successful and seamless hierarchical storage management lies in the management and distribution of data across the different layers. For detailed information, see Hierarchical Storage Management

.

Tape

Tape is probably the most common form of removeable storage media for the iSeries today. It has been around for some time, so it has been widely adopted and continues to be popular.

Tape provides several advantages over other storage methods, including the following:

- **Cost.** Tape is very cost effective, when compared to disk. While the cost of disk storage is falling, the cost of tape is also falling on a dollar per gigabyte basis.
- **Security.** It is easy to keep your data secure by securely storing backups or copies at an off-site location. This also guards against on-site data corruption from viruses, fire, natural disasters, accidental deletions, and other data-loss incidents.

- **Reusable.** You can rotate your tapes for backups, which means that you have more than one set of tapes. When one set expires, you can write over the data on it and use the media again.
- **Capacity.** As the amount of data you generate grows, you can increase your capacity by simply adding additional tape volumes.

While there are many advantages to using tape, there are also some drawbacks:

- **Durability.** Tape is reusable, but tapes do wear out over time and require replacement. If they are not replaced when needed, your data can be compromised. For information on how to determine if a tape is wearing out, go to Handle tape media errors.
- **Sequential access to data.** Tapes give you access to the data on them in the order in which that data was recorded. If you are looking for a particular item on a tape, it could take some time to locate it. One way to avoid this problem is to use a program such as Backup, Recovery and Media Services (BRMS) to help you keep track of where your data is stored on your tape volumes.

For information on the tape devices you can use with your iSeries, refer to the following:

Single tape drives
This topic describes single tape drives, their advantages and limitations, and in what context they are most useful.

Tape automation
This topic contains information about what tape automation is and how it can help you manage your data and more efficiently carry out your backup strategy.

To compare tape and optical media in order to decide which is best for you, go to Comparison of tape and optical.

For detailed information about the tape technologies that you can use with your iSeries server, see Tape and Optical Storage

.

Single tape drives

Single tape devices enable you to enjoy the benefits of tape media with your iSeries server. They are excellent for smaller companies that may not have much data to back up or retrieve. If a full backup of your server fits on a single tape, you can perform unattended backups with a single tape drive. However, once your backup exceeds one tape, you need to have someone present to switch the tapes in the drive as the backup runs.

Tape devices support hardware compression, which increases the apparent capacity of your media by encoding the data to use less space. The data is compressed and decompressed by the hardware each time it is read or written on your tape device and is transparent to applications.

Tape automation

As the amount of data a company generates grows, it quickly becomes impractical and even impossible to use a single tape drive to perform media management. Tape automation provides a way for companies to efficiently manage larger amounts of data. It provides several advantages, including the following:

- **Increased productivity.** Because tape libraries can hold a large number of tapes, you are not required to have personnel assigned to replacing the media in your drives. This frees your personnel to focus their attention on more important activities.
- **Increased consistency of backups.** Because you reduce the need for human intervention, you also reduce the possibility of human error. Also, with multiple drives at your disposal, your backup can still complete, even if one drive fails.

- **Shortened backup windows.** Tape automation enables you to write data to more than one drive at a time, which reduces the amount of time that the backup runs.

Tape automation provides many advantages, but it also makes media management extremely important. The number of volumes that you use could be large, and you need to be able to keep track of what data is stored on which volumes, and where those volumes are located. Backup, Recovery and Media Services (BRMS) is a product that can help you manage your backups and backup media when you use tape automation.

For more information on tape automation and how to use tape libraries with your iSeries server, see Manage tape libraries.

Comparison of tape and optical

Tape media is the most common media used today; however, optical media is becoming more prevalent. It is important that you understand the differences between them as you decide which is right for you.

The following table describes some of the differences:

Characteristic	Comparison
Access to data	Optical storage provides random access, whereas tape is sequential access.
Capacity	The lowest capacity tape has a similar capacity to DVD-RAM, but midrange and high capacity tapes typically have 10 to 25 times the capacity of optical.
Compression	The server uses **software** compression to save compressed data to your optical media. This process takes considerable processing unit resources and may increase your save and restore time. Most tape media devices use **hardware** compression, which is normally faster.
Cost	Because you can store a larger amount of data on tape, it has a lower cost per gigabyte.
Data transfer rates	Data transfer rates for tape tend to be higher than for optical, particularly if you use tape drive compression.
Number of media passes or mounts	Optical media can be mounted anywhere from 50,000 to 1 million times, depending on the type of media used. The number of media passes supported by tape varies, but is usually lower than optical.
Reusability	Not all optical media is re-writable. Some optical media are write-once media, which means that once they are written to, they cannot be reused. Tape is reusable.

Optical

The term **optical** refers to any storage method that uses a laser to store and retrieve data from media. Examples of this media are compact disk read-only memory (CD-ROM), digital video disk read-only memory (DVD-ROM), digital video disk random access memory (DVD-RAM), write-once read-many (WORM) optical cartridges, and erasable optical cartridges.

Optical media is a newer technology than tape, and one that is growing in popularity in the iSeries community. Following are some of its advantages:

- **Long shelf life.** With proper care, optical media can last a long time, depending on what kind of optical media you choose.

- **Great for archiving.** Several forms of optical media are write-once read-many, which means that once data is written to them, they cannot be reused. This is excellent for archiving because data is preserved permanently with no possibility of being overwritten.
- **Transportability.** Optical media are widely used on other platforms, including the PC. For example, data written on a DVD-RAM could be read on a PC or any other system with an optical device and the same file system.
- **Random access.** Optical media provide the capability to pinpoint a particular piece of data stored on it, independent of the other data on the volume or the order in which that data was stored on the volume.

While optical has many advantages, there are also some disadvantages that you have to consider, as follows:

- Reusable - the write-once read-many characteristic of some optical media makes it excellent for archiving, but it also prevents you from being able to use that media again.
- Writing time - the server uses software compression to write compressed data to your optical media. This process takes considerable processing unit resources and may increase the time needed to write and restore that data.

To compare tape and optical media in order to decide which is best for you, go to Comparison of tape and optical.

For information on optical media and your iSeries server, refer to Optical Support

. For broad information about the optical technologies, see Tape and Optical Storage

.

Storage area networks (SANs)

Storage area networks (SAN) are a newer development in the disk and tape attachment business. They consolidate the storage of multiple, heterogeneous platforms into a single set of centrally managed resources. To do so, they employ a combination of technologies, including hardware, software, and networking components. They support direct, high speed data transfers between servers and storage devices in the following ways:

- **Server to storage.** This is the traditional model of interaction with storage devices. The advantage of a SAN in this context is that the same storage device may be accessed serially or concurrently by multiple servers.
- **Server to server.** A SAN may be used for high-speed, high-volume communications between servers.
- **Storage to storage.** This outboard data movement capability enables data to be moved without server intervention, thereby freeing up server processor cycles for other activities like application processing. Examples include a disk device backing up its data to a tape device without server intervention, or remote device mirroring across the SAN. This type of data transfer is not currently available on the iSeries.

For more information about storage area networks in general and how they work, see Introduction to Storage Area Network, SAN

.

SANs provide many benefits in your iSeries network, including the following:

- **Scalability.** Storage is independent of the server itself, so you are not limited by the number of disks you can attach directly to the server.
- **Improved availability of applications.** Storage is independent of applications and is accessible through alternative data paths.
- **Better application performance.** Storage processing is moved from the servers onto a separate network.
- **Centralized and consolidated storage.** Storage capacity can be connected to servers at a greater distance, and storage resources can be disconnected from individual hosts. The results can be lower overall costs through better use of the storage, lower management costs, increased flexibility, and increased control.
- **Data transfer for storage at remote sites.** You can keep a remote copy of data for disaster protection.
- **Simplified centralized management.** A single image of storage media simplifies management.

For more information on how you can use storage area networks with your iSeries, refer to iSeries in Storage Area Networks

.

Related information for storage solutions

Listed below are the iSeries manuals and IBM Redbooks(TM) (in PDF format), and Web sites that relate to the Storage Solutions topic. You can view or print any of the PDFs.

Manuals

- Backup, Recovery and Media Services for iSeries

  (about 290 pages)
- Hierarchical Storage Management

  (about 173 pages)
- Optical Support

  (about 211 pages)

Redbooks

- Introduction to Storage Area Network, SAN

  (about 154 pages)
- iSeries in Storage Area Networks

  (about 312 pages)

Web sites

- Backup, Recovery and Media Services

- Hierarchical Storage Management

- iSeries Storage

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