

LESSON 4.1_4.2

98-365 Windows Server Administration Fundamentals

Identify Storage Technologies and Understand RAID

Lesson Overview

In this lesson, you will learn:

- Local storage options
- Network storage options
- Redundant Array of Independent Disk (RAID) options

Anticipatory Set

- List three different RAID configurations.
- Which of these three bus types has the fastest transfer speed?
 - Parallel ATA (PATA)
 - Serial ATA (SATA)
 - USB 2.0

Local Storage Options

- Local storage options can range from a simple single disk to a Redundant Array of Independent Disks (RAID).
- Local storage options can be broken down into bus types:
 - Serial Advanced Technology Attachment (SATA)
 - Integrated Drive Electronics (IDE, now called Parallel ATA or PATA)
 - Small Computer System Interface (SCSI)
 - Serial Attached SCSI (SAS)

Local Storage Options

- SATA drives have taken the place of the tradition PATA drives.
- SATA have several advantages over PATA:
 - Reduced cable bulk and cost
 - Faster and more efficient data transfer
 - Hot-swapping technology

Local Storage Options (continued)

- SAS drives have taken the place of the traditional SCSI and Ultra SCSI drives in server class machines.
- SAS have several advantages over SCSI.
 - Supports up to 65535 devices while SCSI has a limit of 8–16 devices
 - Higher transfer speeds range from 3 to 6 Gbits/s
 - Faster and more efficient data transfer

Network Storage Options

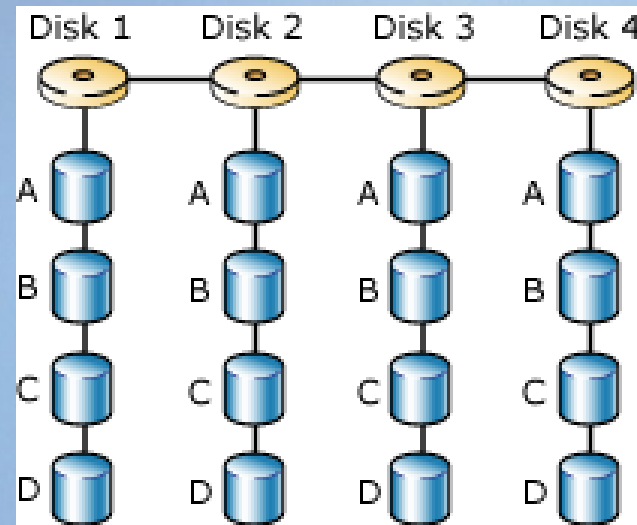
- Network Attached Storage (NAS)
 - Contain one or more hard disks, typically in a RAID configuration
 - Configured over the network
 - Uses file-based protocols such as Network File System (NFS)
 - Removes the file serving responsibility from other servers on the network
- Storage Area Network (SAN)
 - Architecture to attach remote storage devices to servers
 - Does not provide file abstraction

Redundant Array of Independent Disk (RAID) Options

- **RAID**
 - A disk system that contains multiple disk drives, called an array, to provide greater performance, reliability, storage capacity, and lower cost
 - Each level uses a different algorithm to implement fault tolerance.
- **Types of RAID**
 - Hardware
 - Improved performance
 - Software
 - Lower cost, requires more processor cycles

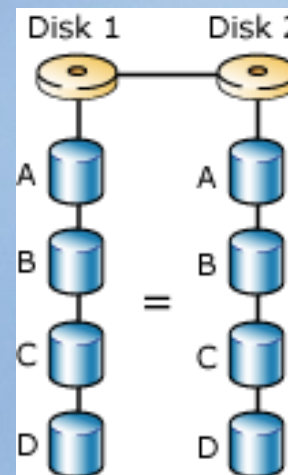
RAID 0 Option

- o Data is divided into blocks and spread in a fixed order among all disks in an array.
- o Improves read and write performance by spreading operations across multiple disks.
- o Does not provide fault tolerance.



RAID 1 Option

- Disk mirroring provides a redundant, identical copy of a selected disk.
- All data written to the primary disk is written to the mirror disk.
- Provides fault tolerance and generally improves read performance but may degrade write performance.
- Total space = 1/2 total drive space
- 2x100 GB hard drives
- Total space after RAID 1 = 100 GB



RAID 5 Option

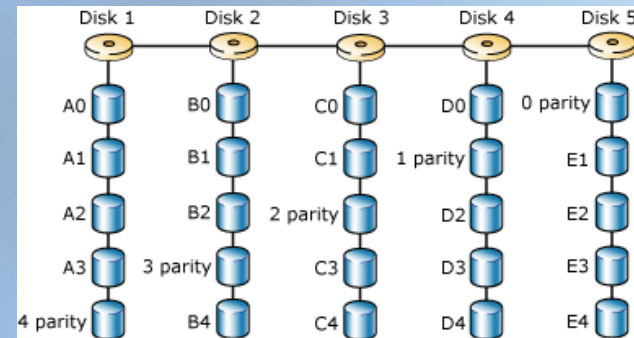
- Disk striping with parity
- Writes the parity across all the disks
- Data redundancy is provided by the parity information.
- The data and parity information are arranged on the disk array so that the two types of information are always on different disks.
- Striping with parity offers better performance than disk mirroring (RAID 1).
- However, when a stripe member is missing, read performance is decreased.

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RAID 5 Option (continued)

- Drive space used for parity = $1/n(\text{tds})$
 - n = number of disks in the array
 - tds = total drive space
- For example:
 - $n = 5$ drives
 - $\text{tds} = 500 \text{ GB}$ ($5 \times 100 \text{ GB}$ drives)
 - $1/5(500) = 100 \text{ GB}$ of drive space used for parity
 - 400 GB available free space after RAID 5 is configured



RAID 10 Option

- Uses a striped array of disks that are then mirrored to another identical set of striped disks
- Provides the performance benefits of disk striping with the disk redundancy of mirroring
- Provides the highest read-and-write performance of any one of the other RAID levels, but at the expense of using two times as many disks
- Organizations with a need for high availability would benefit from a RAID 10 solutions
 - Banks, government, online retail stores

Lesson Review

- What is the minimum number of drives required for a RAID 5 solution?
- What is the main benefit to having a hardware-based RAID as opposed to a software-based RAID?
- What is an advantage of having Network Attached Storage as opposed to Direct Attached Storage?