Implementing Mass Storage

Chapter 9

CompTIA A+ (220-110x)

Mike Meyers and Steve Nicholson

Episode: **Understanding Partitioning**

Objective(s): Core 2: 1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.

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Episode Description

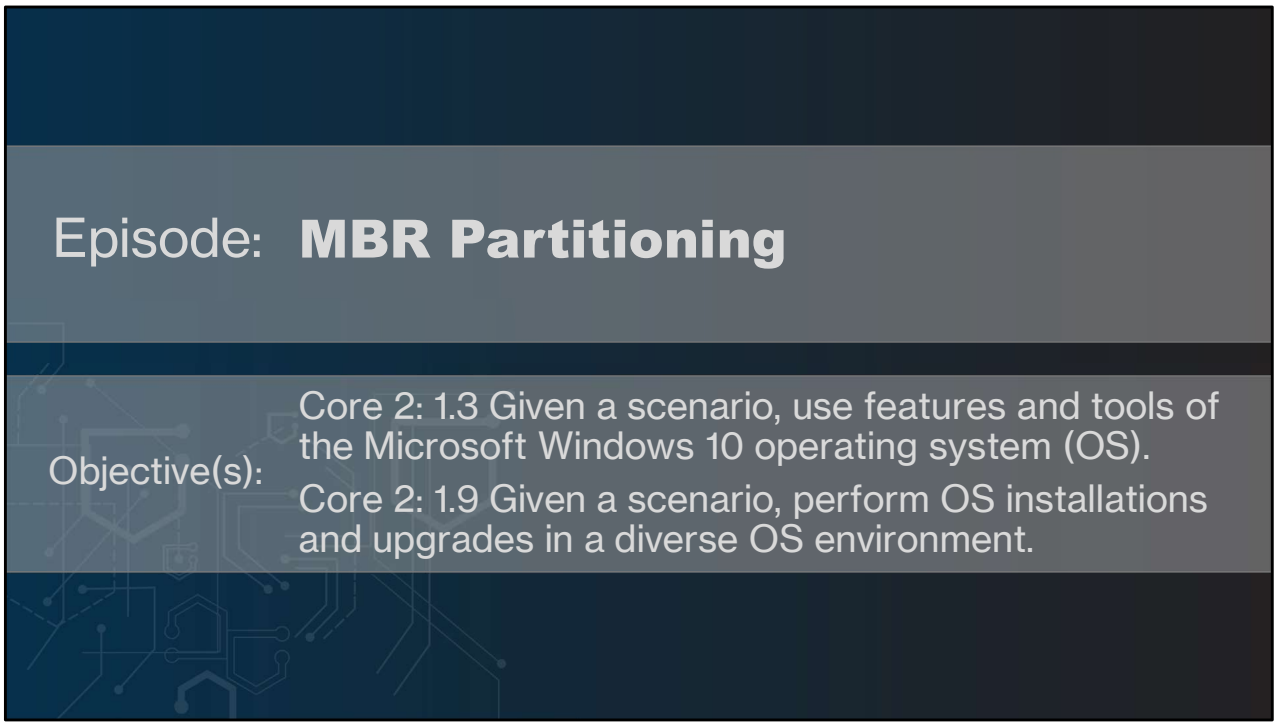
We organize physical storage into logical subdivisions called partitions. Partitions serve several critical functions beyond just storing our data. Specialized partitions support virtual memory, boot, and recovery functions.

Key Terms

- 1:42 - Swap partition
- 1:57 - Objective term - Recovery partition

Quick Review

- A partition is a logical electronic device readable by an operating system
- Partitions define the location of operating systems, swap files, and recovery partitions
- Partitions must be created and mounted
- In Windows, partitions manifest as drive letters; in Linux/macOS, partitions manifest as folders


Episode: MBR Partitioning
Objective(s):
Core 2: 1.3 Given a scenario, use features and tools of the Microsoft Windows 10 operating system (OS).
Core 2: 1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.

Episode Description

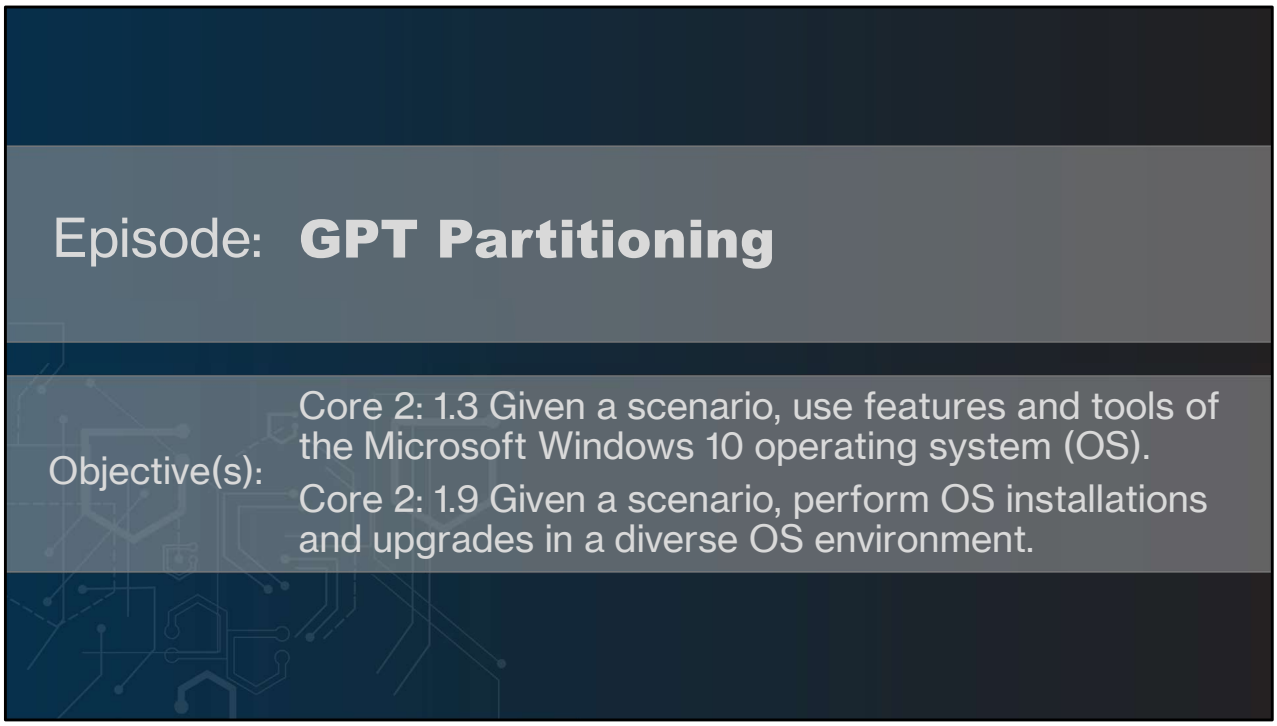
Master boot record (MBR) partitioning is the oldest way to partition mass storage. All operating systems still support MBR, so it's important for techs to recognize its limitations.

Key Terms

- 0:22 - Objective term - Master boot record (MBR)
- 1:06 - LBA 0
- 3:31 - Max. 2 TB per partition
- 3:46 - Limited to 4 partitions
- 8:38 - Extended partitions
- 9:33 - Primary partitions
- 10:02 - Logical drives
- 11:26 - 2 TB limit became a real problem

Quick Review

- Master boot record (MBR) is the oldest type of partition still in use today
- MBR consists of a boot loader and up to four partitions with one set as an active partition
- If more than four partitions are needed on a single drive, an extended partition with additional logical drives can be created


Episode: GPT Partitioning
Objective(s):
Core 2: 1.3 Given a scenario, use features and tools of the Microsoft Windows 10 operating system (OS).
Core 2: 1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.

Episode Description

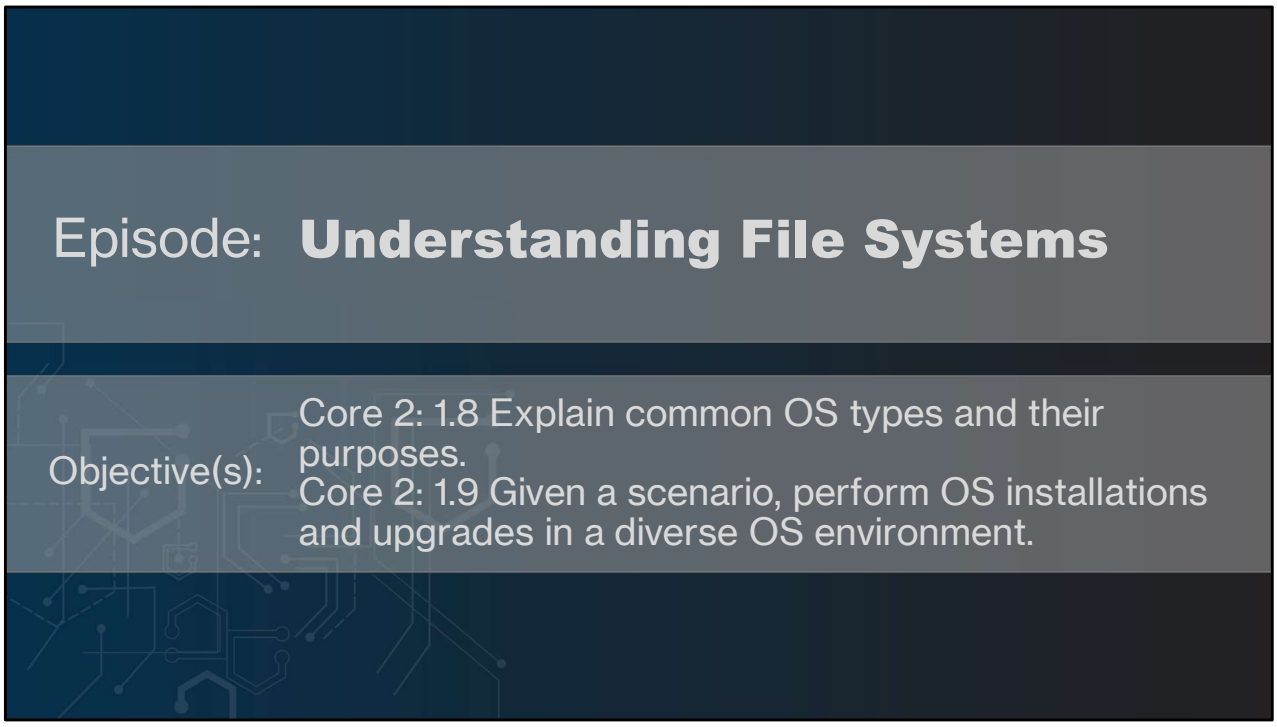
Globally unique identifier (GUID) partition table (GPT) partitioning is more modern and used by all operating systems today. It's important for a tech to understand the benefits of GPT as well as how to use it.

Key Terms

- 0:21 - Objective term - GUID partition table (GPT)
- 0:52 - Globally unique identifier (GUID)
- 1:22 - 128 partitions per drive
- 1:42 - 18.8 million terabytes per partition

Quick Review

- GUID partition table (GPT) has many features that improve upon MBR partitions
- GPT supports up to 128 volumes on a partition
- GPT uses a protective MBR but the GPT starts at the primary GPT header and includes a secondary GPT header


Episode: Understanding File Systems
Objective(s):
Core 2: 1.8 Explain common OS types and their purposes.
Core 2: 1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.

Episode Description

A file system organizes data stored on mass storage devices. A tech should have a good understanding of multiple file systems, why they are used and how to troubleshoot them.

Key Terms

- 5:09 - Objective term - FAT32
- 10:35 - Fragmentation

Quick Review

- A file system is applied to a partition by formatting
- A partition must be formatted before they are usable
- All file systems have a data structure that keeps track of the location of files and folders
- File systems often have a problem with fragmentation

Episode: **Popular File Systems**

Objective(s): Core 2: 1.8 Explain common OS types and their purposes.

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Episode Description

There are many file systems available for different systems, purposes, and type of storage. It's important to know the difference between files systems such as NTFS, ext3, FAT, and HFS+.

Key Terms

- 0:41 - Objective term - FAT32
- 1:10 - 8 TiB volumes
- 1:41 - Objective term - New Technology File System (NTFS)
- 1:58 - Massive volumes up to 16 EiB
- 2:07 - 256 TiB
- 2:17 - Master file table (MFT)
- 3:36 - Objective term - Extensible File Allocation Table (exFAT)

Key Terms

- 4:16 - Compact Disc File System (CDFS)
- 4:37 - 4 GiB
- 4:55 - Objective term - Third extended filesystem (ext3) and Fourth extended filesystem (ext4)
- 5:03 - ext3 supports 32 TiB volumes and 2 GiB files
- 5:15 - ext4 supports 2 EiB volumes and 16 TiB files

Quick Review

- FAT32 and exFAT are handy for thumb drives
- NTFS is the primary file system for Windows
- NTFS supports compression, encryption, and folder/file security
- CDFS is for optical media
- Linux uses ext3 and ext4 file systems

Episode: **Formatting in Action**

Objective(s):

Core 2: 1.3 Given a scenario, use features and tools of the Microsoft Windows 10 operating system (OS).

Core 2: 1.8 Explain common OS types and their purposes.

Core 2: 1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.

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Episode Description

File systems are created through the processes called formatting. There's a number of different ways to format mass storage and a good tech knows how to do this for the most common file systems.

Key Terms

- Demo NTFS in Windows and ext4 in Linux

Quick Review

- Windows uses Disk Management to partition and format disks
- New drives must first be initialized in Windows
- There is no single Linux tool for partitioning and formatting – choose one you like

Episode: **Dynamic Disks**

Objective(s): Core 2: 1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.

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Episode Description

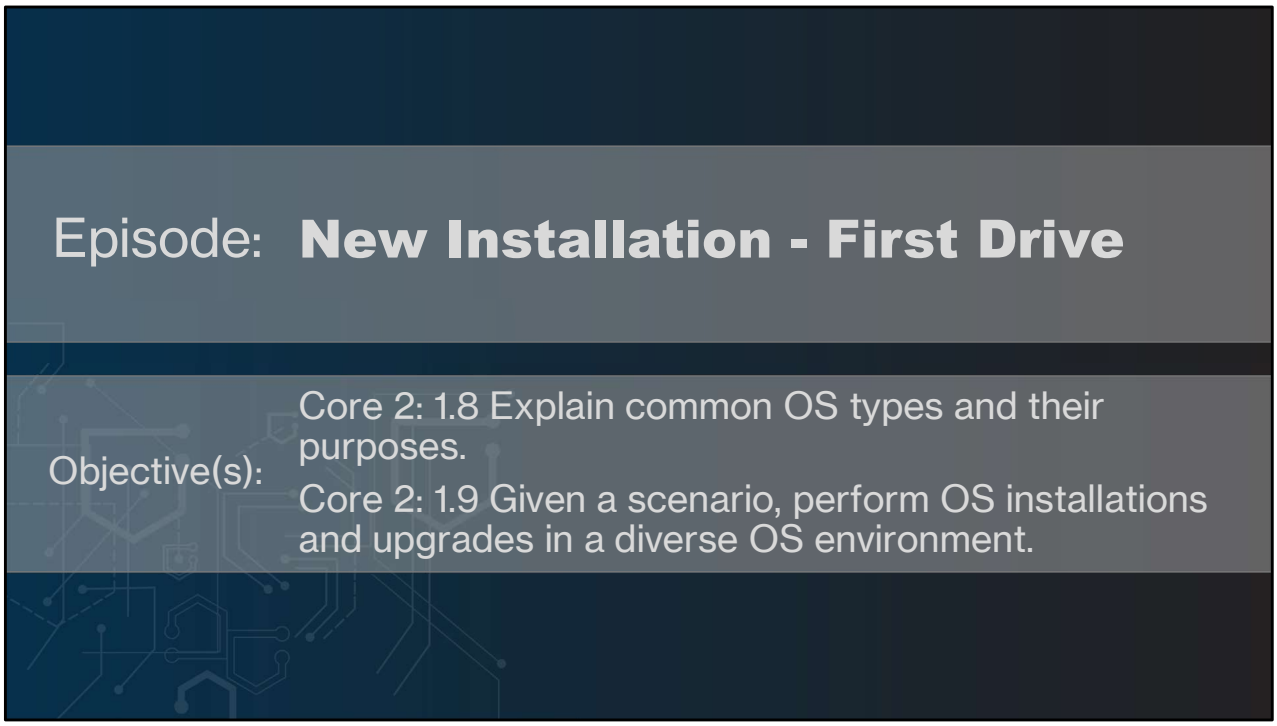
Dynamic disks are unique to the Windows operating system. Make sure you understand why Microsoft uses dynamic disks and how to configure spanning, striping, etc.

Key Terms

- 0:28 - Dynamic disks
- 0:48 - Shrink or expand
- 4:12 - Spanned volume
- 7:28 - 1. Keep the boot drive basic (not dynamic)
- 7:52 - 2. Set boot drive to GPT
- 8:04 - 3. It's easy to create dynamic disks, but changing back to basic erases all the disk data

Quick Review

- Dynamic disks are unique to Windows
- Drives must be converted from basic to dynamic in Disk Management
- Dynamic disks enable shrinking, extending, and spanning volumes without losing the data on the disk


Episode: New Installation - First Drive
Objective(s):
Core 2: 1.8 Explain common OS types and their purposes.
Core 2: 1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.

Episode Description

A brand-new system doesn't have a bootable drive with an installed operating system. In this episode you will go through the process of setting up an initial drive and installing an operating system using bootable media.

Key Terms

- Demo new hard drive installation on Windows and Linux

Quick Review

- The first drive on a system relies on the OS install program to provide partition and format functions
- The partitioning and formatting tools in installation programs provide a smaller subset of tools compared to their main tools
- Installation tools may provide features not normally seen anywhere else (such as swap file creation)

Episode: **Software RAID in Storage Spaces**

Objective(s):

Core 1: 3.3 Given a scenario, select and install storage devices.

Core 2: 1.3 Given a scenario, use features and tools of the Microsoft Windows 10 operating system (OS).

Episode Description

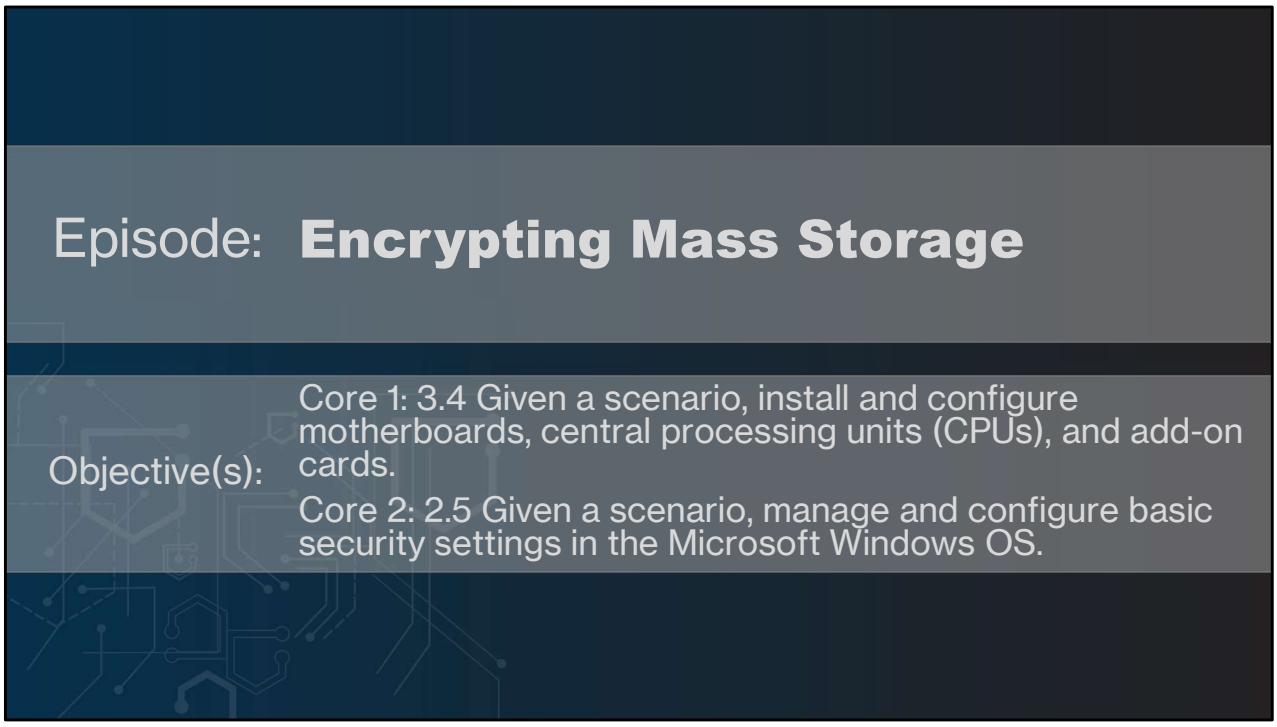
Microsoft's Storage Spaces feature provides a superb tool to configure many different RAID configurations on any Windows system. A good tech knows which types of RAID it supports and how to set them up.

Key Terms

- 3:57 - Just a bunch of disks (JBOD)
- 7:00 - Three-way mirror

Quick Review

- Software RAID uses the operating system to configure the RAID array
- Windows comes with a powerful tool called Storage Spaces to configure advanced software RAID arrays
- Storage Spaces provides superb flexibility



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Episode Description

Securing mass storage is a critical aspect of system security. Make sure you know the many ways a system's mass storage can be encrypted.

Key Terms

- 0:32 - Objective term - Encryption
- 1:01 - File-based encryption
- 1:04 - Disk-based encryption
- 1:41 - Objective term - Encrypting File System (EFS)
- 4:23 - Objective term - BitLocker for Windows
- 4:28 - Objective term - FileVault for macOS
- 4:46 - Objective term - Trusted Platform Module (TPM)
- 7:55 - Objective term - BitLocker To Go

Quick Review

- File-based encryption encrypts files and folders; disk-based encryption encrypts entire drives
- Windows uses Encrypted File System (EFS) to encrypt folders and files
- Windows uses Bitlocker to encrypt entire hard drives
- Bitlocker requires a system with a Trusted Platform Module (TPM) chip


Episode: Maintaining Storage Disks
Objective(s):
Core 2: 3.3 Given a scenario, use best practice procedures for malware removal.
Core 2: 3.1 Given a scenario, troubleshoot common Windows OS problems.

Episode Description

Mass storage devices need ongoing maintenance to ensure optimal operation. Windows systems have automated tools to optimize performance and to check drives for bad areas.

Key Terms

- 0:22 - Error checking
- 0:28 - Optimization
- 1:23 - Objective term - Chkdsk
- 2:41 - Objective term - Optimization/disk defragment/defrag

Quick Review

- Error checking runs chkdsk on a disk partition to check for bad sectors
- Trimming allows data to be written in individual pages termed "available for use"
- Optimizing trims blocks in disks to allow for new data to be written in partially full blocks