Module 2

Configuring local storage

Module Overview

- Managing disks in Windows Server
- Managing volumes in Windows Server

Lesson 1: Managing disks in Windows Server

- Selecting a partition table format
- Selecting a disk type
- Selecting a file system
- Implementing ReFS
- Demonstration: Configuring ReFS
- Using .vhd and .vhdx file types
- Selecting a disk type

Selecting a partition table format

MBR

- Standard partition table format since the early 1980s
- Supports **a maximum of four primary partitions per drive**
- Can partition a disk **up to 2 TB**

GPT

- GPT is the successor of the MBR partition table format
- Supports **a maximum of 128 partitions per drive**
- Can partition a disk **up to 18 exabytes**

✓ **Use MBR for disks smaller than 2 TB**

✓ **Use GPT for disks larger than 2 TB**

Selecting a disk type

Basic disks are:

- Initialized for basic storage
- The default storage for the Windows operating system

Dynamic disks can:

- Be modified without restarting the Windows system
- Provide several options for configuring volumes

Disk volume requirements include:

- **A system volume** for hardware-specific files that are required to start the server
- **A boot volume** for the Windows operating system files

Selecting a file system

When selecting a file system, consider the differences between FAT, NTFS, and ReFS

FAT provides:

- Basic file system
- Partition size limitations
- FAT32 to enable larger disks
- exFAT developed for flash drives

NTFS provides:

- Metadata
- Auditing and journaling
- Security (ACLs and encryption)

ReFS provides:

- Backward compatibility support for NTFS
- Enhanced data verification and error correction
- Support for larger files, directories, and volumes

Implementing ReFS

ReFS has a number of advantages over NTFS:

- Metadata integrity with checksums
- Expanded protection against data corruption
- Maximizes reliability
- Large volume, file, and directory sizes
- Storage pooling and virtualization
- Redundancy for fault tolerance
- Disk scrubbing for protection against latent disk errors
- Resiliency to corruptions
- Shared storage pools across machines

Implementing ReFS

When to use ReFS:

- Microsoft Hyper-V workloads
  - ReFS has performance advantages when using both .vhd and .vhdx files.
- Storage Spaces Direct
  - In Windows Server 2016, nodes in a cluster can share **direct attached storage**.
  - In this situation, ReFS provides improved throughput, but also supports higher capacity disks used by the cluster nodes.
- Archive data
  - The resiliency that ReFS provides means it is a good choice for data that you want to retain for longer periods.

Demonstration: Configuring ReFS

In this demonstration, you will see how to:

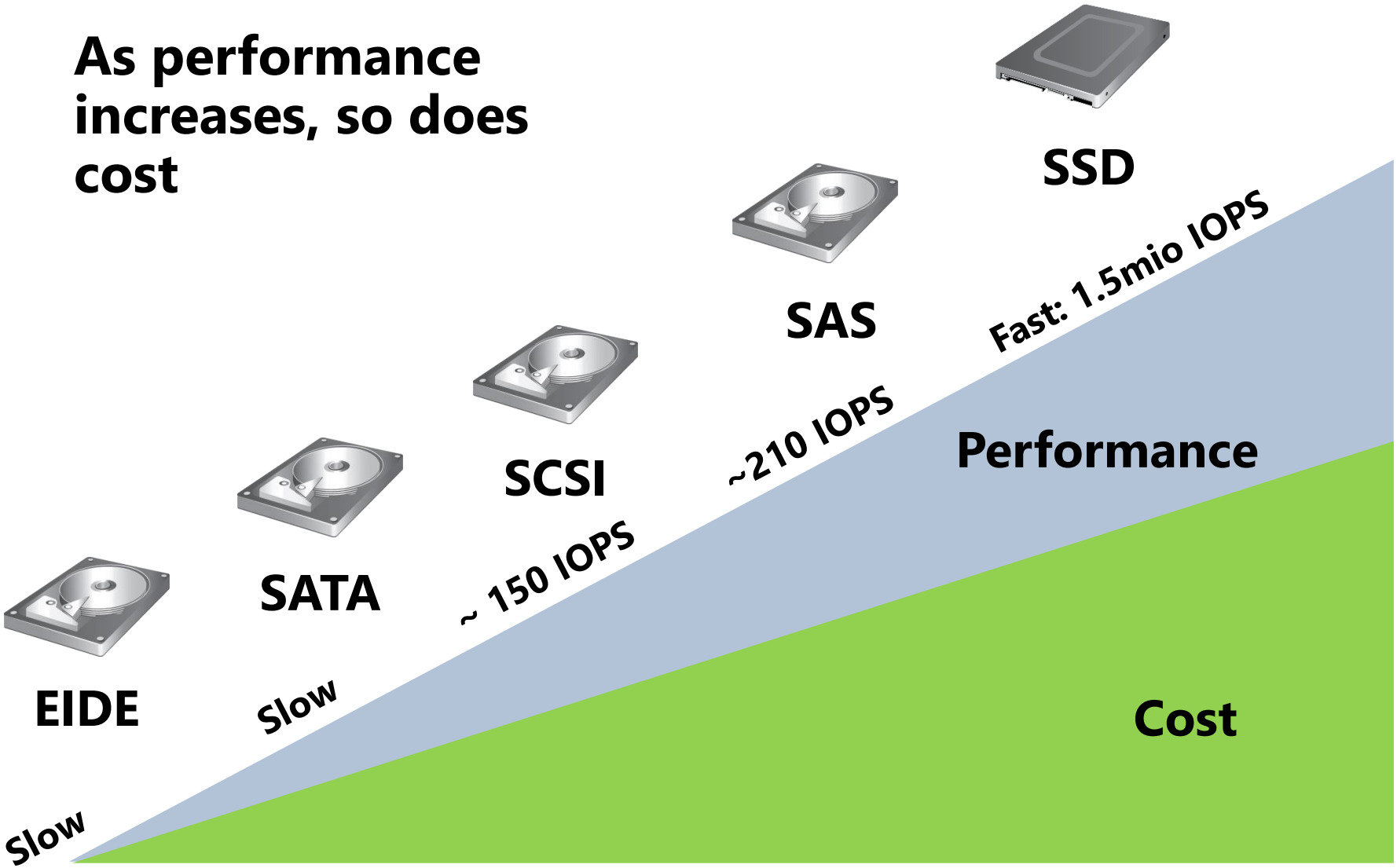
- Retrieve the volume and sector information for an NTFS volume by using the **fsutil** command
- Reformat the NTFS volume as an ReFS volume
- Retrieve the volume and sector information for the ReFS volume by using the **fsutil** command

Using .vhd and .vhdx file types

- Virtual hard disks are files that you can use the same way as physical hard disks
- You can:
  - Create and manage virtual hard disks by using Disk Management and **Diskpart.exe**
  - Configure .vhd or .vhdx files
  - Configure computers to start from the virtual hard disk
  - Transfer virtual hard disks from Hyper-V servers, and start computers from the virtual hard disk
- PowerShell for vhd:
  - **New-VHD** -Path c:\sales.vhd -Dynamic -SizeBytes 10Gb | **Mount-VHD** -Passthru | **Initialize-Disk** -Passthru | **New-Partition** -AssignDriveLetter -UseMaximumSize | **Format-Volume** -FileSystem NTFS -Confirm:$false -Force
  - **Get-vhd**
  - **Set-VHD** –Path c:\Sales.vhdx –PhysicalSectorSizeBytes 4096
  - **Convert-vhd**

Selecting a disk type

As performance increases, so does cost



Lesson 2: Managing volumes in Windows Server

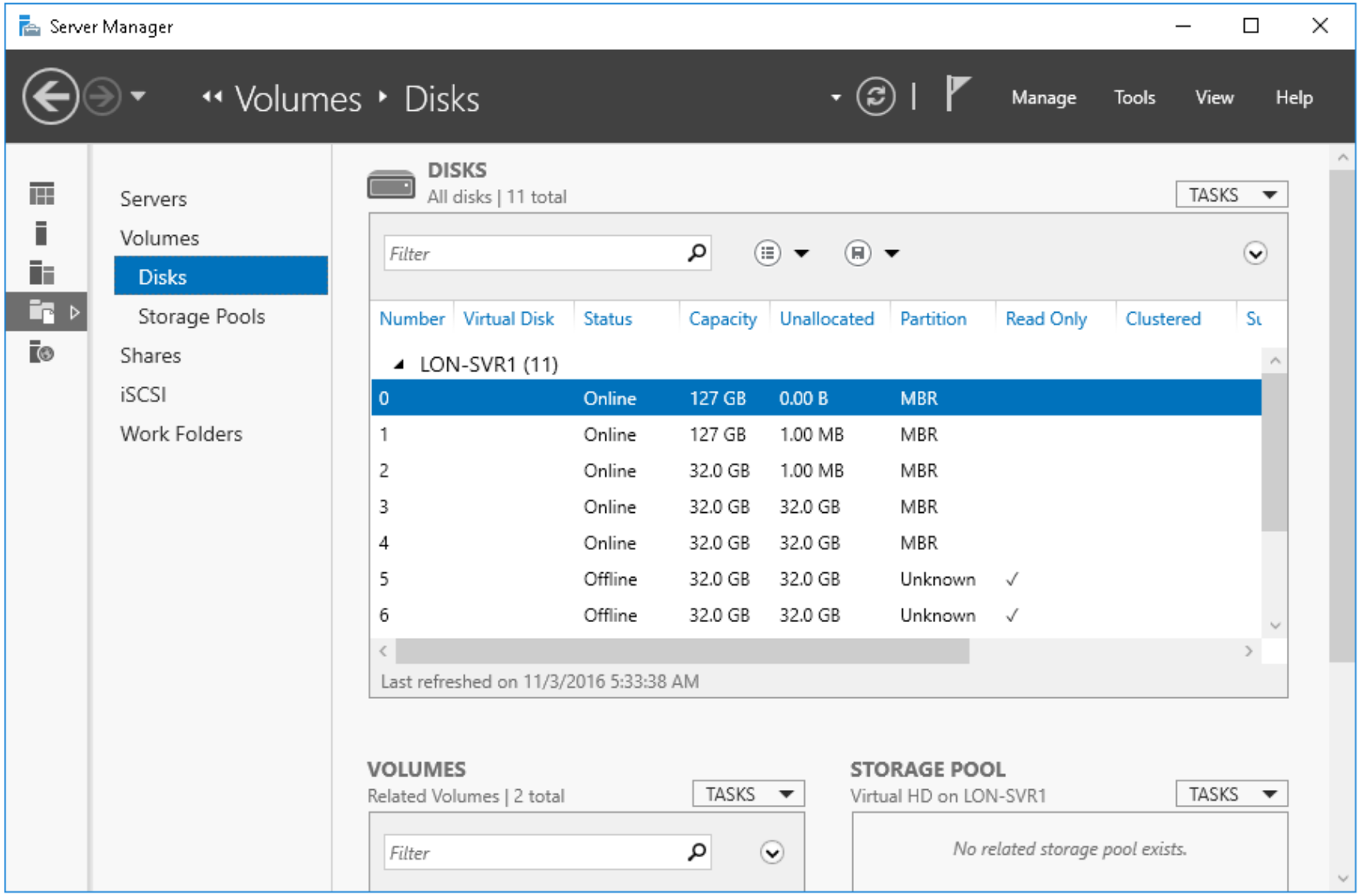
- What are disk volumes?
- Options for managing volumes
- Demonstration: Managing volumes
- Extending and shrinking a volume
- What is RAID?
- RAID levels

What are disk volumes?

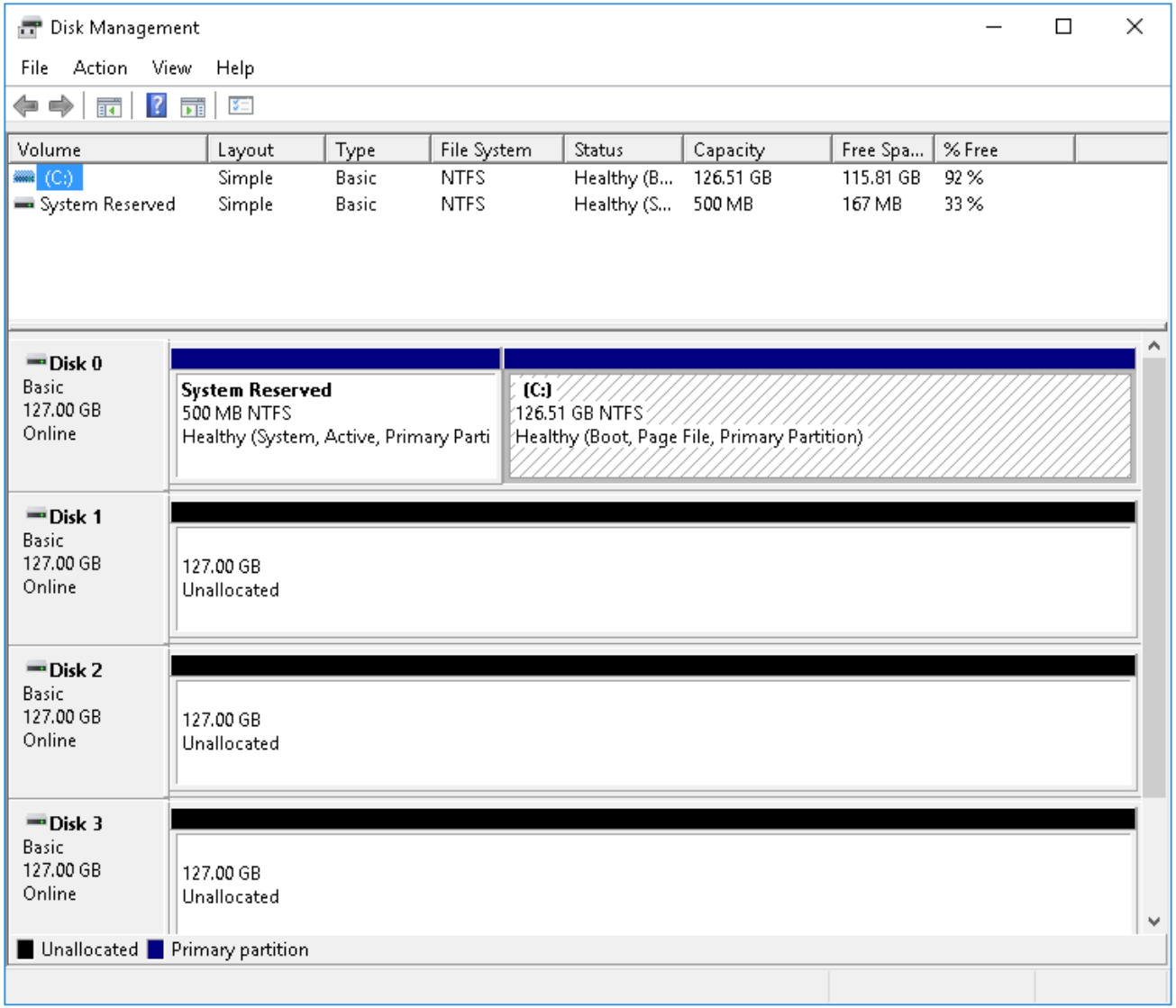
Windows Server 2016 supports the following volume types:

- Simple
- Spanned
- Striped
- Mirrored
- RAID-5

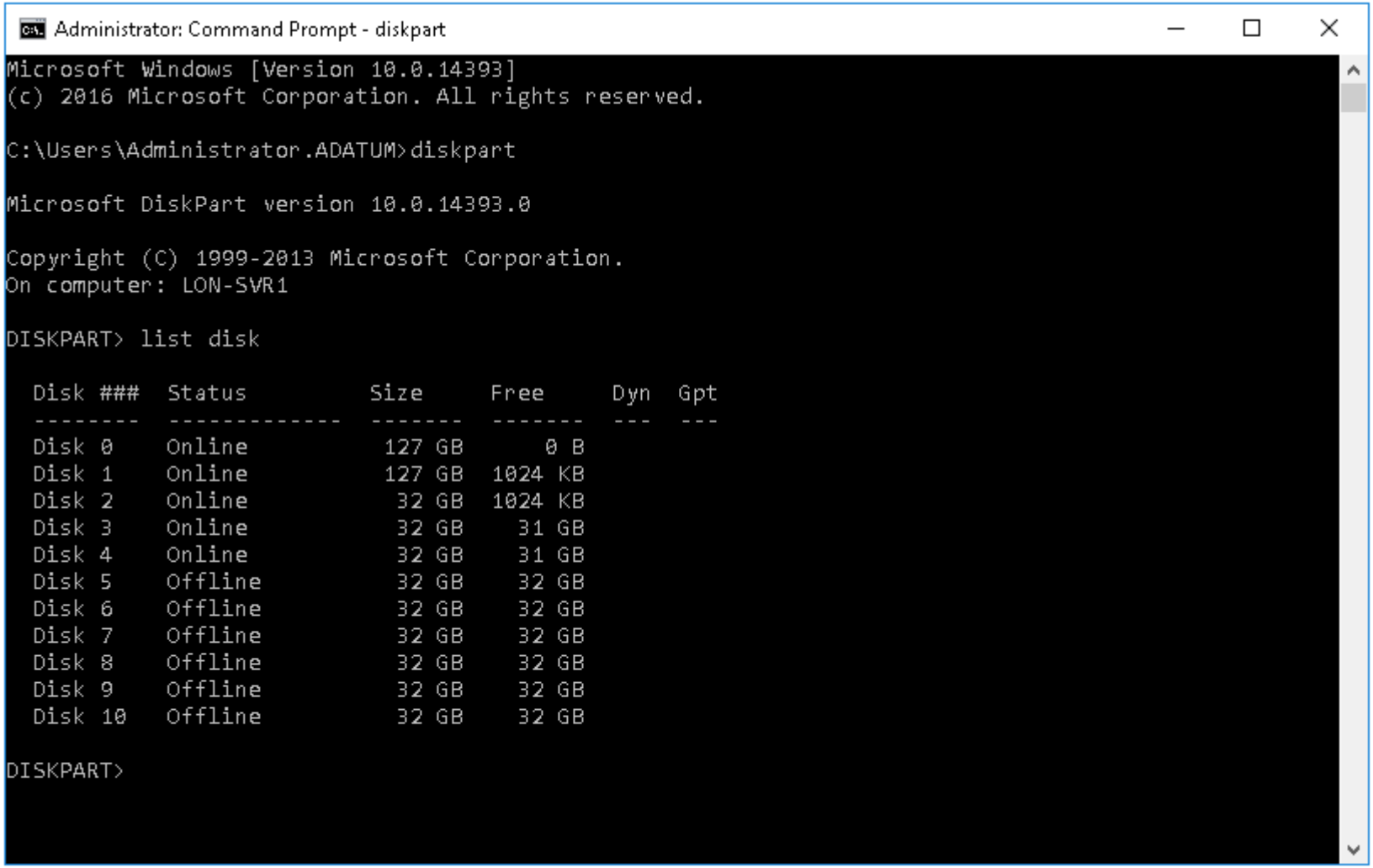
Options for managing volumes



Options for managing volumes



Options for managing volumes



Options for managing volumes

- **Get-disk**
- **Clear-disk**
- **Initialize-disk**
- **Get-volume**
- **Format-volume**

Demonstration: Managing volumes

In this demonstration, you will see how to:

- Create a new volume with Diskpart
- Create a mirrored volume

Extending and shrinking a volume

- You can resize volumes with Windows Server 2016
- When you want to resize a disk, consider the following:
  - You can extend or shrink NTFS volumes
  - You can only extend ReFS volumes
  - You cannot resize FAT, FAT32, and exFAT volumes
  - You can shrink a volume only up to immovable files
  - You cannot shrink a volume with bad clusters

What is RAID?

RAID:

- Combines multiple disks into a single logical unit to provide fault tolerance and performance benefits
- Provides fault tolerance by using:
  - Disk mirroring
  - Parity information
- Can provide performance benefits by spreading disk I/O across multiple disks
- Can be configured using several different levels
- Should not replace server backups

RAID levels

RAID 0

Striped set without parity or mirroring

RAID levels

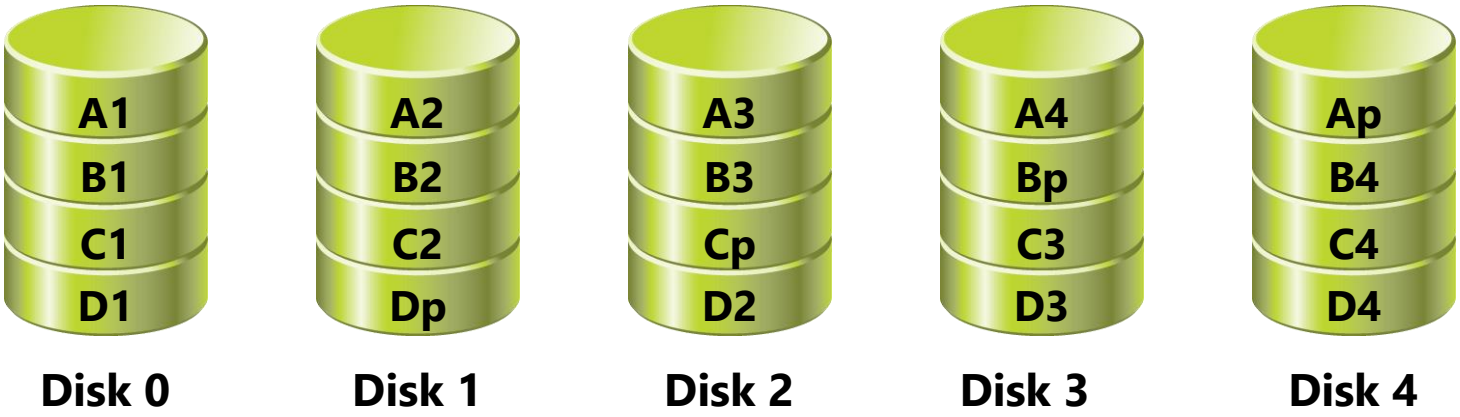
RAID 1

Mirrored drives

RAID levels

RAID 5

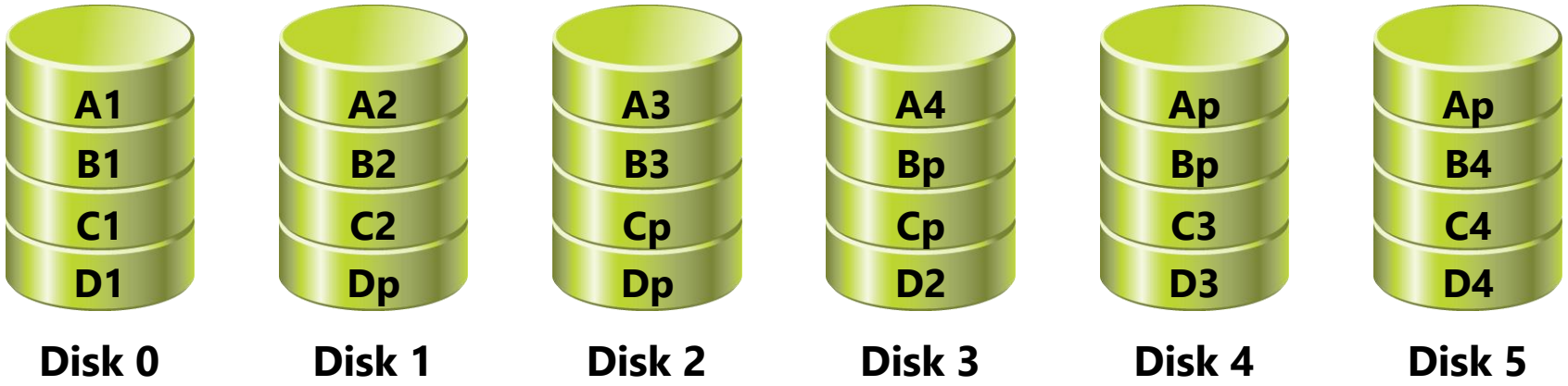
Block-level striped set with parity distributed across all disks



RAID levels

RAID 6

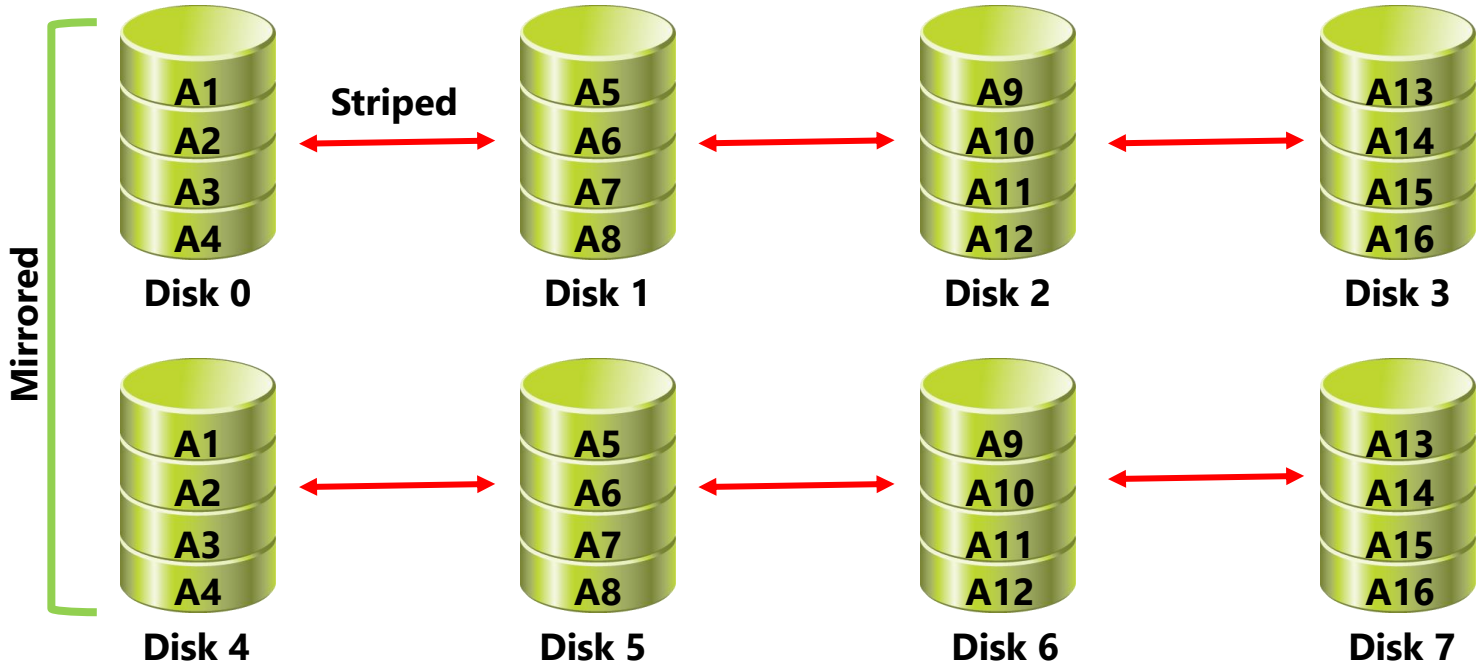
Block-level striped set with parity distributed across all disks



RAID levels

RAID 1 + 0

Each pair of disks is mirrored, then the mirrored disks are striped



Lab: Configuring local storage

- Exercise 1: Creating and managing volumes
- Exercise 2: Resizing volumes
- Exercise 3: Managing virtual hard disks

Logon Information

Virtual machines:	**20740C-LON-DC1** **20740C-LON-SVR1** **20740C-LON-HOST1**
User name:	**Adatum\Administrator**
Password:	**Pa55w.rd**

Estimated Time: 40 minutes

Lab Scenario

Your manager has asked you to add disk space to a file server that is running on a virtual machine. This virtual machine will potentially grow significantly in size in the upcoming months and you might need flexibility in your storage options. Your manager has asked you to optimize the cluster and sector size for virtual machines usage to accommodate large file sizes for storage on virtual machines. You need to assess the best options for storage and ease of expansion for potential future use.

Lab Review

- In the lab, you used the Diskpart.exe command-line tool to create and resize volumes. What alternate Windows PowerShell cmdlets could you have used?
- Your current volume runs out of disk space. You have another disk available in the same server. What actions in the Windows operating system can you perform to help you add disk space?