Microsoft® Official Course

Module2

Implementing Storage in Windows Server

Microsoft®

Module Overview

- Identifying Storage Technologies
- Managing Disks and Volumes
- Fault Tolerance

Lesson 1: Identifying Storage Technologies

- What Is Direct-Attached Storage?
- What Is Network-Attached Storage?
- What Is a Storage Area Network?
- What Is a Fibre Channel SAN?
- What Is an iSCSI SAN?

What Is Direct-Attached Storage?

- Types of direct-attached storage (DAS):
  - Enhanced Integrated Drive Electronics (EIDE)
  - Serial Advanced Technology Attachment (SATA)
  - Small computer system interface (SCSI)
  - Serial-attached SCSI
  - Solid-state drives (SDD)
- Generally, DAS is:
  - Easy to configure and inexpensive
  - Not centralized and can be slow

What Is Network-Attached Storage?

- NAS is storage attached to a dedicated storage device and accessed through network shares
- Advantages:
  - Relatively inexpensive
  - Easy to configure
- Disadvantages:
  - Slower access times
  - Not a real enterprise solution
- NAS offers centralized storage at an affordable price

What Is a Storage Area Network?

- SANs offers great availability and flexibility, at the highest cost
- SANs can be implemented by using Fibre Channel or iSCSI
- Advantages:
  - Centralized storage
  - Fastest access times
  - High level of redundancy
  - Common infrastructure
- Disadvantages:
  - More expensive
  - Requires specialized skills
  - Requires specialized tools

What Is a Fibre Channel SAN?

- Fibre Channel transmits the SCSI commands over twisted-pair copper wire or fiber-optic cables

Component	Description
HBA	An interface card for Fibre Channel networks placed in a server to provide access to a SAN
Fibre Channel switches	Switches route SCSI commands rather than routing IP traffic
Fibre Channel network cables	Twisted-pair copper wire or fiber-optic cables
Storage devices	Devices contain hundreds of disks and provide terabytes of storage
LUN	Part of the storage exposed to servers as drive letters
Multipath I/O	Multiple paths from a host to a storage LUN, that allow for path redundancy and added bandwidth

What Is an iSCSI SAN?

- iSCSI transmits SCSI commands over IP networks

Component	Description
IP Network	The IP network should provide high performance and redundancy A dedicated network is recommended
iSCSI Targets	Run on the storage device and enable access to the disks
iSCSI Initiators	A software component or host adapter on the server that provides access to iSCSI targets
iSCSI Qualified Name (IQN)	A globally unique identifier used to address initiators and targets on an iSCSI network

Lesson 2: Managing Disks and Volumes

- What Are Partition Tables?
- Basic Disks vs. Dynamic Disks
- Selecting a File System
- What Are Virtual Hard Disks?
- What Are Mount Points and Links?
- Demonstration: How to Create and Manage Volumes
- What Are Storage Quotas?
- Demonstration: How to Create a Quota by Using FSRM

What Are Partition Tables?

- Partition tables define how disks are organized and sized
- Two Types:
  - Master boot record (MBR)
    - For use with less than 2 TB disks
    - Allows for four primary partitions
    - Does not support writing across multiple disks
  - GUID partition table (GPT)
    - For use with greater than 2 TB disks
    - Can have up to 128 partitions
    - Supports writing across multiple disks

Basic Disks vs. Dynamic Disks

- Basic disks can include primary partitions, extended partitions, and logical drives
- Dynamic disks can include simple, spanned, striped, mirrored, and RAID-5 volumes

- Disk volume requirements include:
  - System volume for hardware-specific files required to start the server
  - Boot volume for the operating system files

Selecting a File System

- Windows Server 2012 supports:
  - File Allocation Table (FAT)
  - FAT32
  - Extended FAT (exFAT)
  - New Technology File System (NTFS)
  - Resilient File System (ReFS)

- Use ReFS with Windows Server 2012 for very large disk volumes
- Use NTFS with Windows Server 2012 for general use

What Are Virtual Hard Disks?

- File Format:
  - .vhd versus .vhdx
  - .vhdx offers more scale and better performance at scale
- File Type:
  - Dynamically expanding VHD
    - Very efficient use of space
  - Fixed-size VHD
    - Up-front storage resource allocation
  - Differencing VHD
    - Isolates changes and can be used with base images

What Are Mount Points and Links?

- A mount point references a location on a disk enabling the operating system access to disk resources
- Use mount points when:
  - You need disk space without changing the folders
  - No driver letters are available

- Links
  - Symbolic file link
  - Symbolic directory link

Demonstration: How to Create and Manage Volumes

- In this demonstration, you will see how to create and manage volumes in Windows Server

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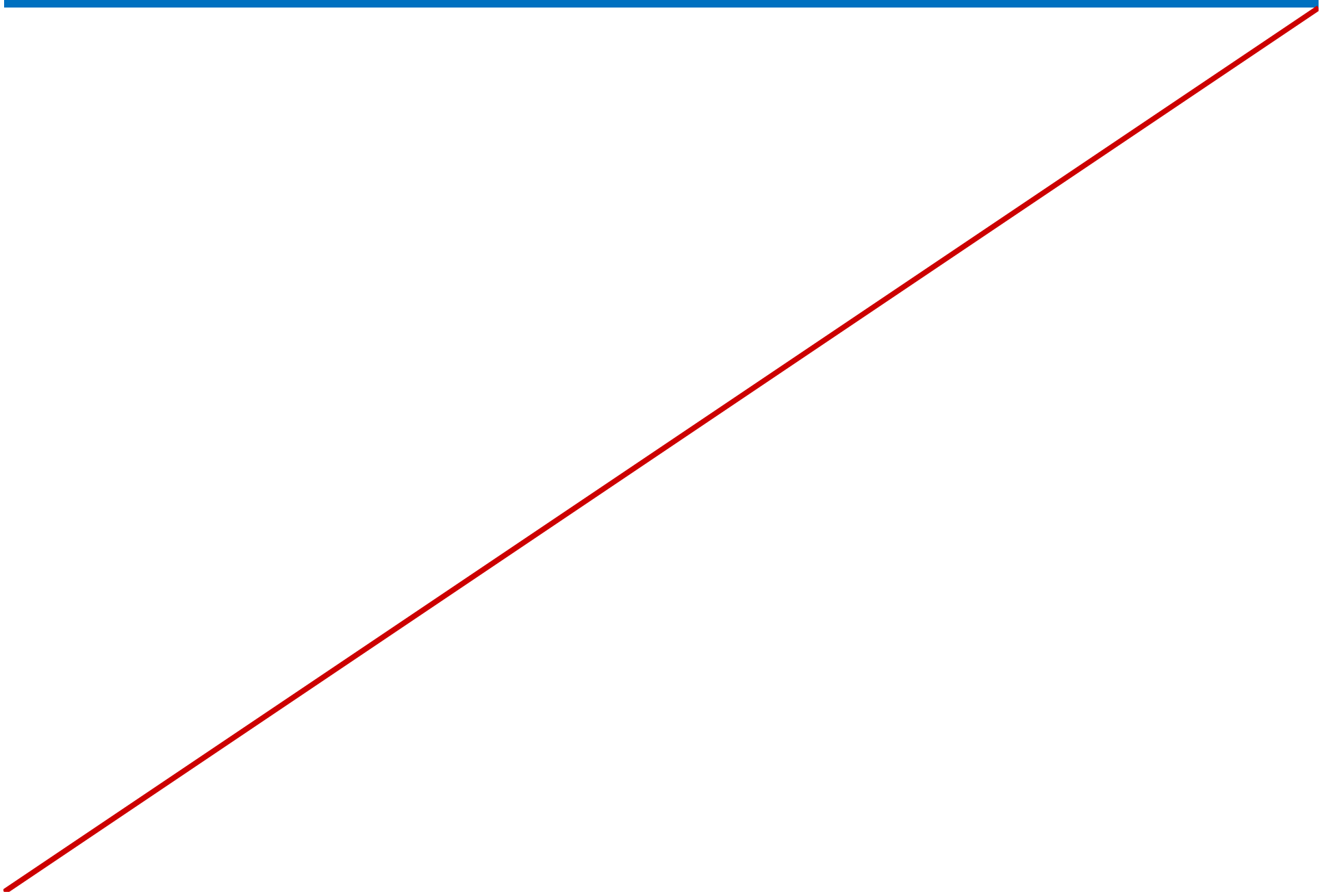

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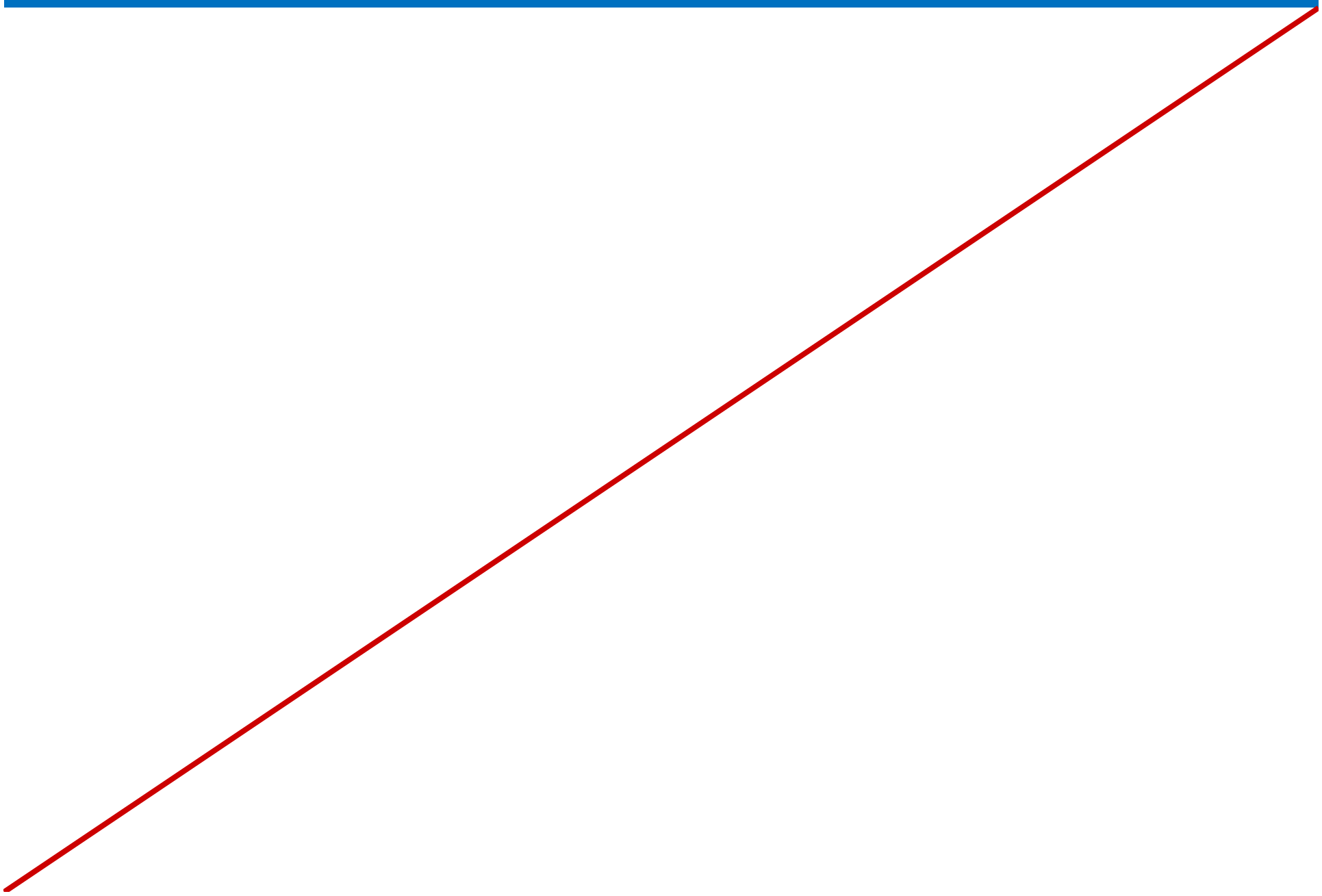

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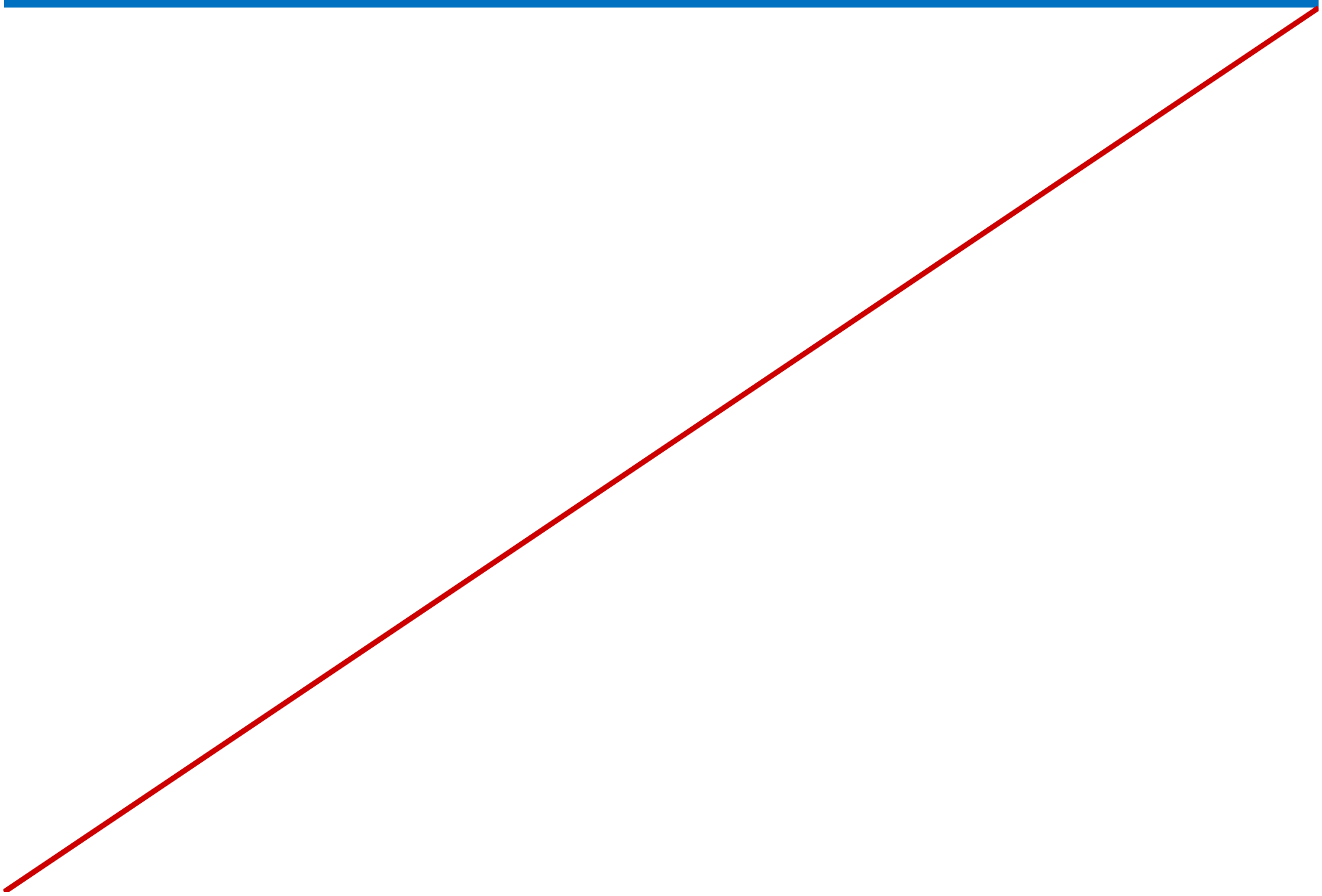

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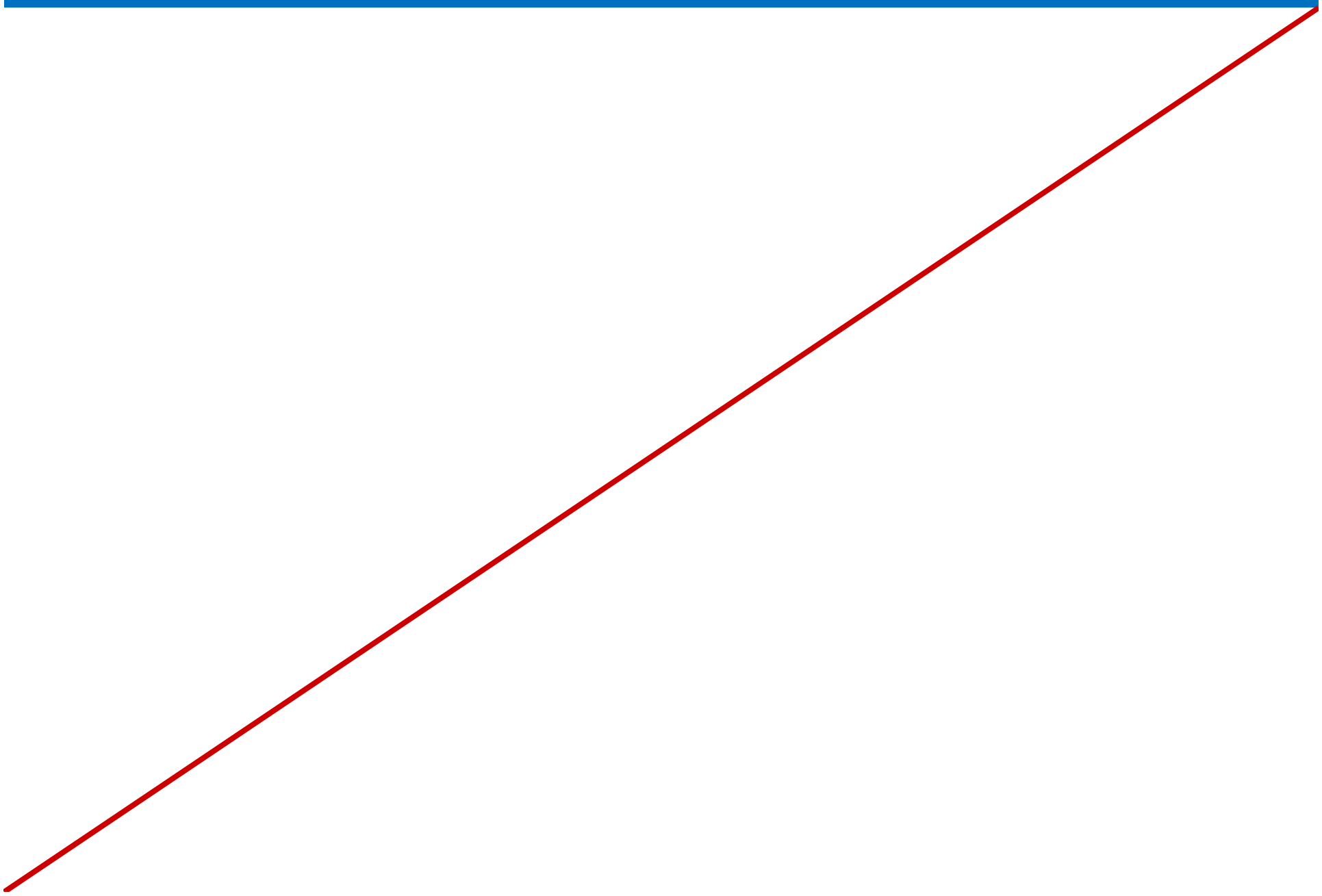

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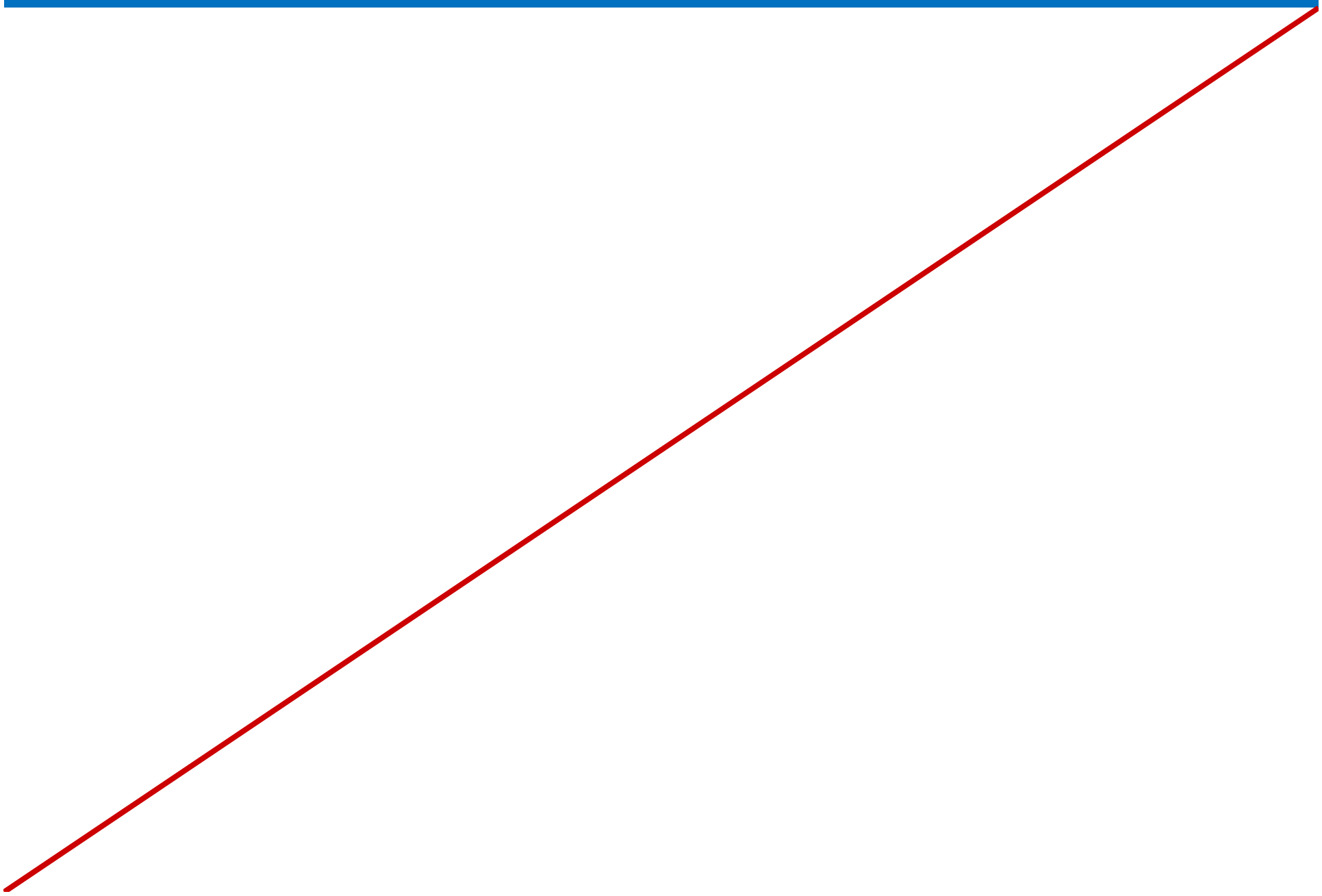

What Are Storage Quotas?

- Use quota management to limit disk space usage and provide notifications when thresholds are reached
- Quota notifications can do any of the following:
  - Send email notifications
  - Log an event in Event Viewer
  - Run a command or script
  - Generate storage reports

Demonstration: How to Create a Quota by Using FSRM

- In this demonstration, you will see how to create a quota by using FSRM

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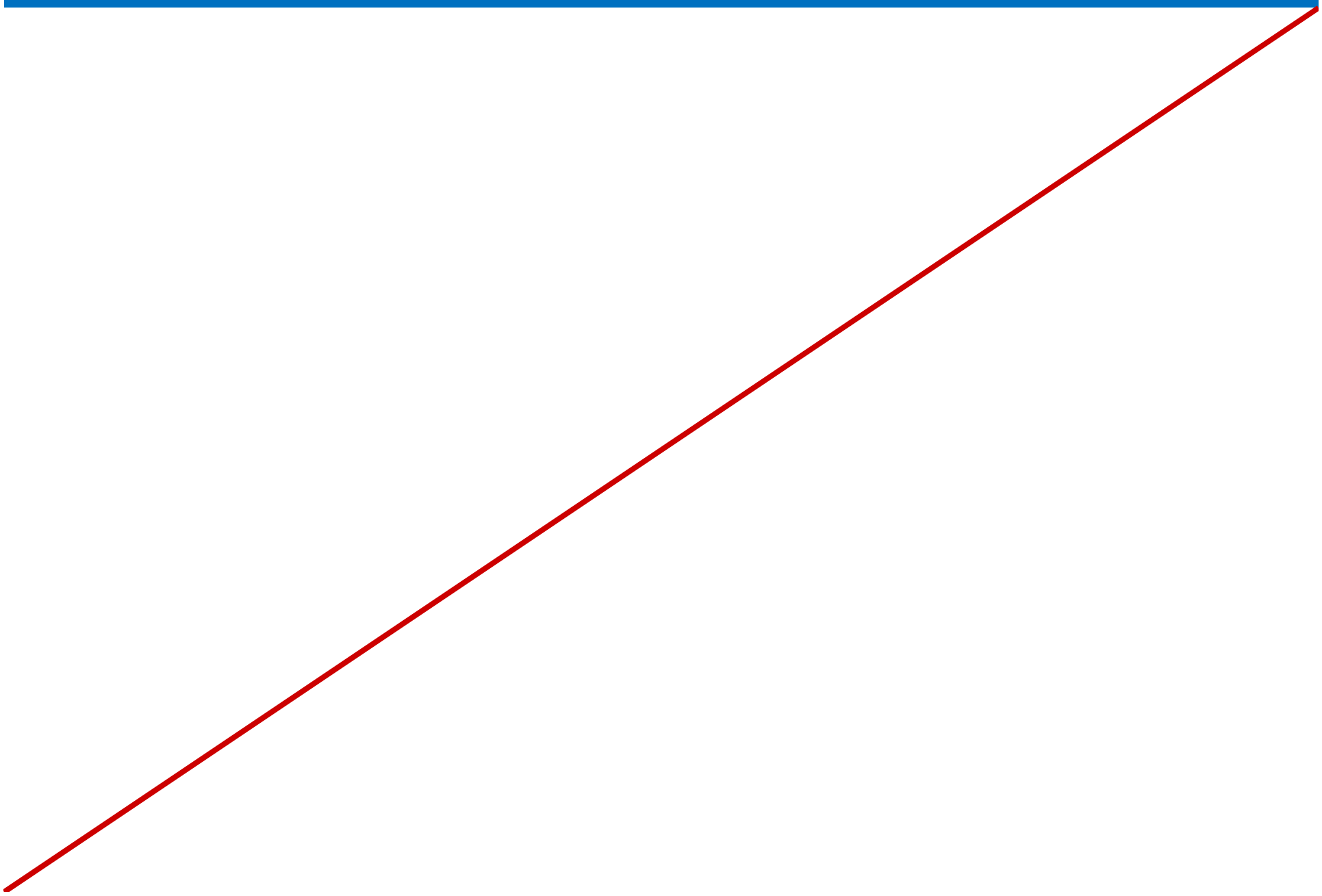


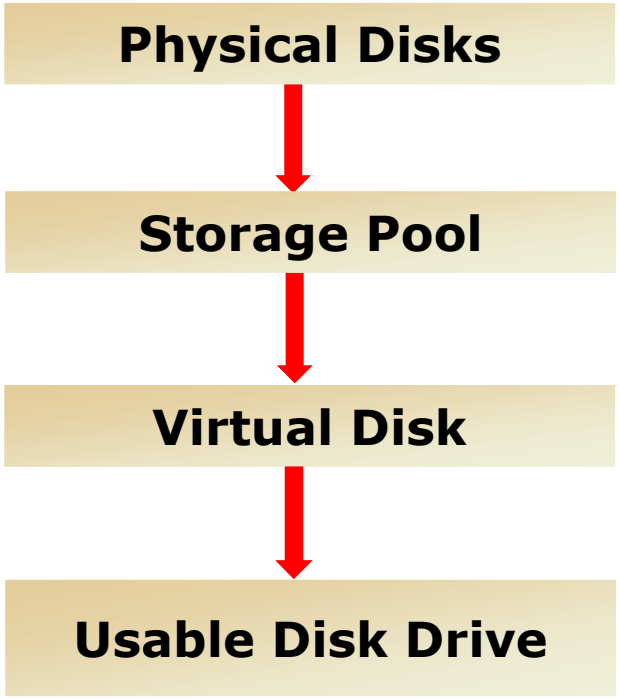
Lesson 3: Fault Tolerance

- What Are Storage Spaces?
- Demonstration: How to Implement and Manage Storage Spaces
- What Is RAID?
- What Are RAID Levels
- Demonstration: How to Implement RAID by Using the Disk Management console

What Are Storage Spaces?

- You can add disks of any type and size to a Storage Pool , then create a highly available "Virtual Disk" which can be managed as a single Storage Space

- Storage Spaces also allow for:
  - Built-in redundancy
  - Thin provisioning: providing just-in-time allocation of disk space



Demonstration: How to Implement and Manage Storage Spaces

- In this demonstration, you will see how to implement mirroring by using Storage Spaces

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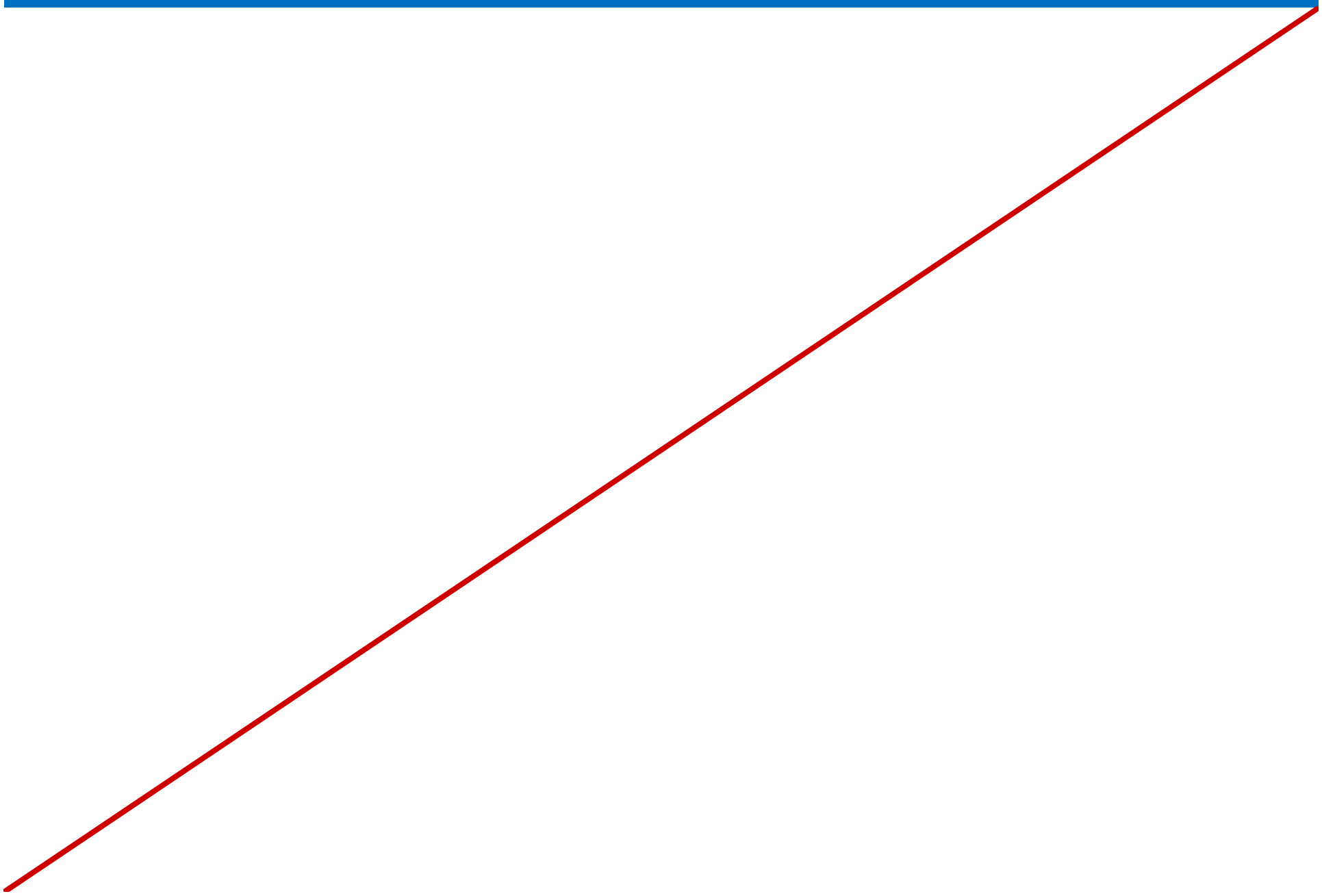

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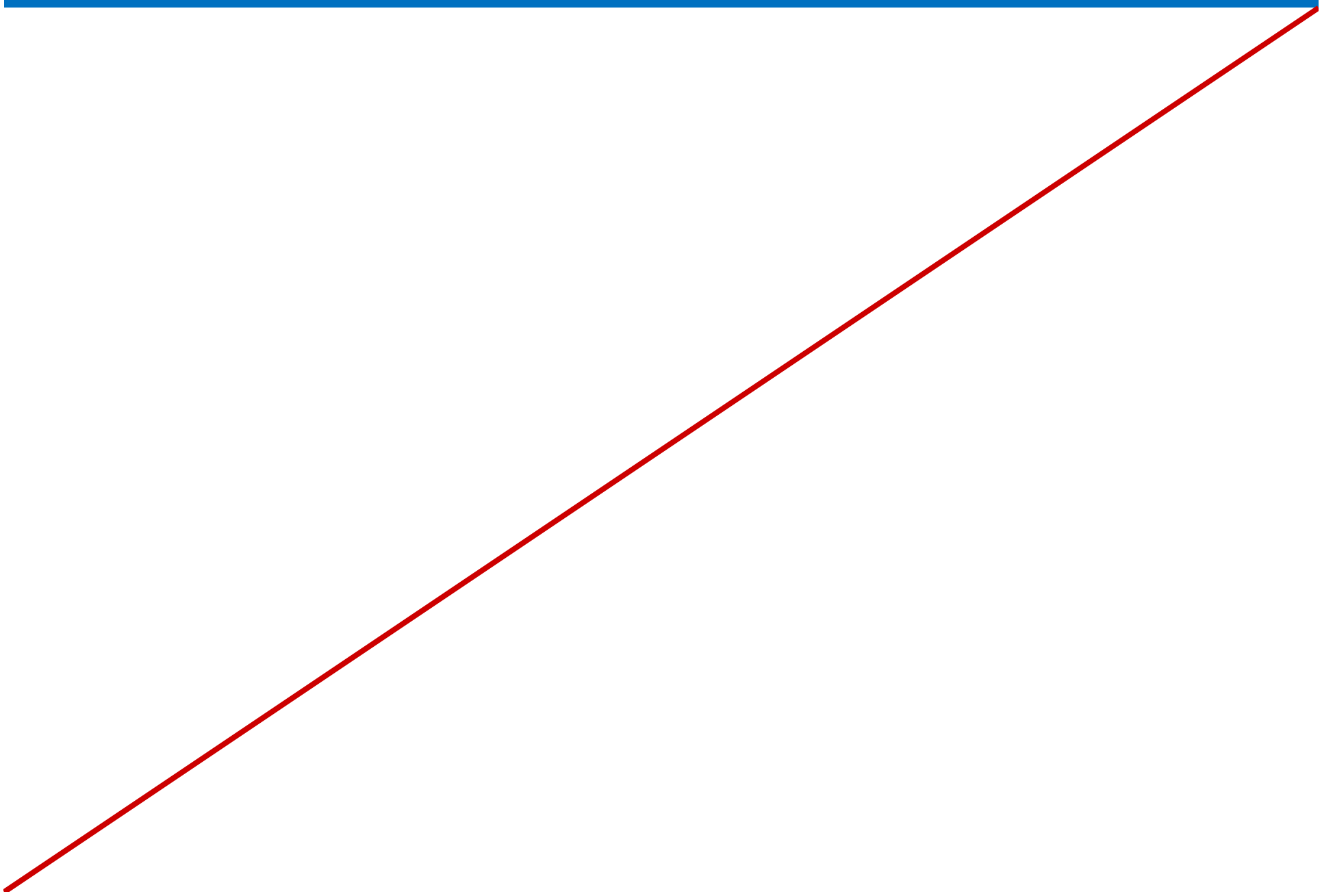

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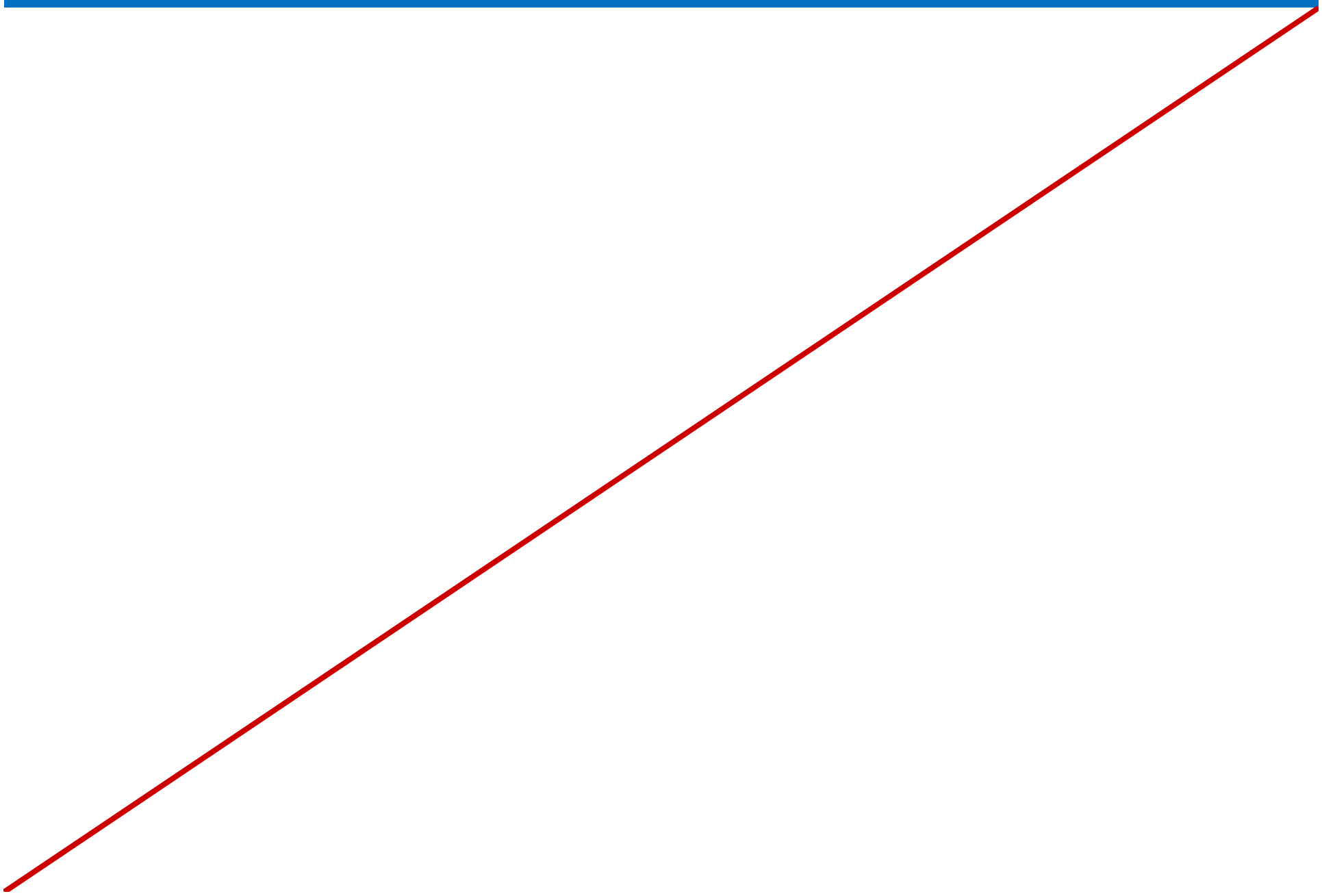

What Is RAID?

- RAID combines multiple disks into a single logical unit to provide fault tolerance and performance
- RAID provides fault tolerance by using:
  - Disk mirroring
  - Parity information
- RAID can provide performance benefits by spreading disk I/O across multiple disks

- Hardware RAID vs. Software RAID

What Are RAID Levels

- RAID levels provide for different levels of fault tolerance and performance

- RAID Levels 1 through 6
- RAID Levels

Demonstration: How to Implement RAID by Using the Disk Management Console

- In this demonstration, you will see how to implement mirroring and RAID-5 by using Disk Management

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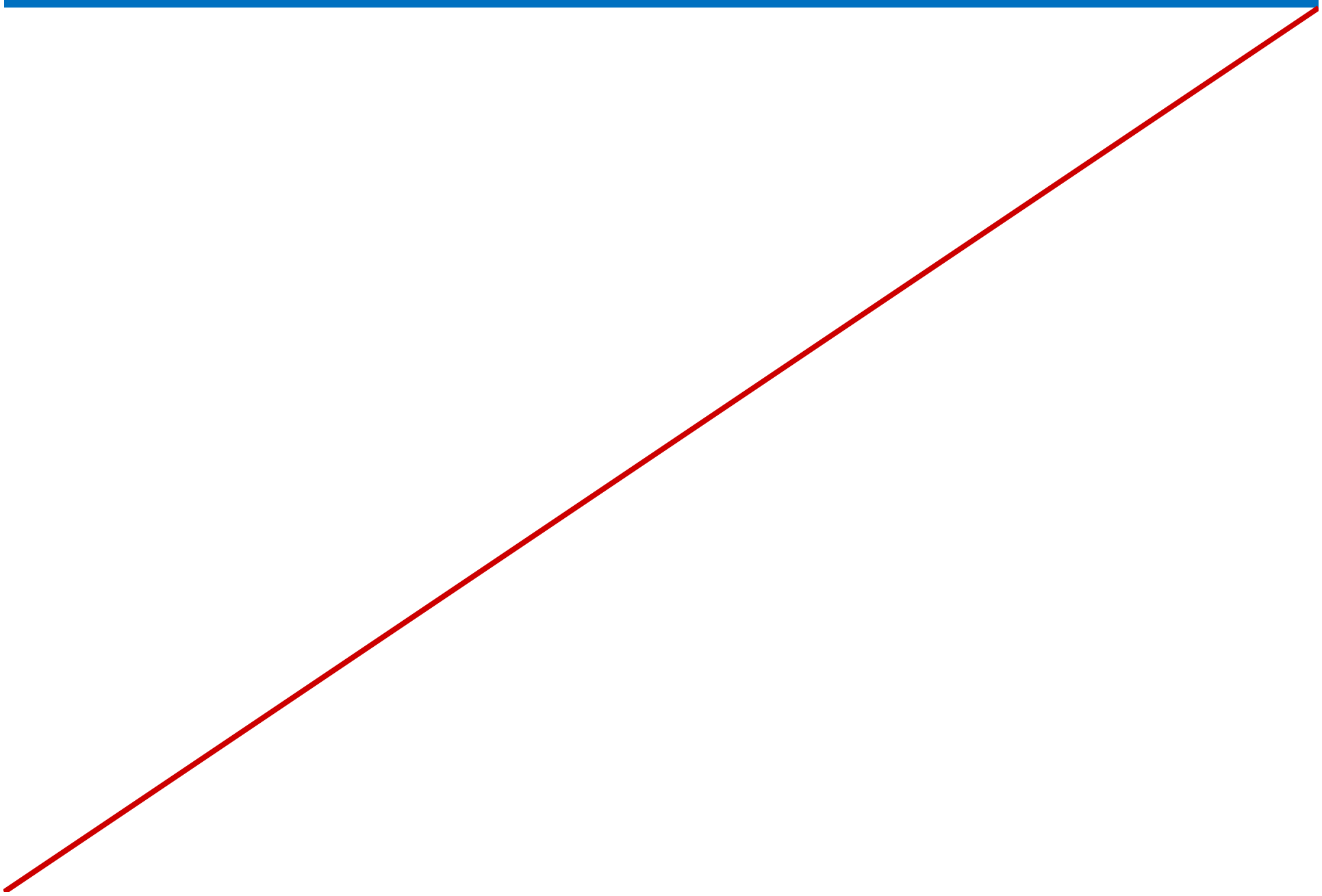

Lab: Implementing Storage in Windows Server

- Exercise 1: Creating and Mounting a VHD File
- Exercise 2: Creating and Making Available New Volumes
- Exercise 3: Vary the Sizes of the NTFS and ReFS Volumes
- Exercise 4: Creating a Fault-Tolerant Disk Configuration by Using Storage Spaces

Logon Information
Virtual Machines: 10967A-LON-DC1, 10967A-LON-SVR1
User Name: ADATUM\Administrator
Password: Pa$$w0rd

Estimated Time: 50 minutes

Lab Scenario

A. Datum has just procured a new server, and it is your job to add storage to the new infrastructure. You will add disks of various sizes by using different methodologies.

Lab Review

- What kind of storage is easiest to configure and why?
- How would you determine the kind of storage to implement?

Module Review and Takeaways

- Review Questions
- Tools
- Common Issues and Troubleshooting Tips

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