

**REVIEW LESSON**

MTA Course: 98-365 Windows Server® Administration Fundamentals

Lesson name: Understanding Storage 4.1\_4.2

Topic: Identify storage technologies; Understand RAID

(One 50-minute class period)

File name: WinServerFund\_RL\_4.1\_4.2

**Lesson Objectives**

**4.1:** Identify storage technologies. *This objective may include but is not limited to:* advantages and disadvantages of different storage types; local (SATA, SCSI, IDE); NAS; SAN; fiber channel; iSCSI; NFS; FC HBA and FC switches; iSCSI hardware.

**4.2:** Understand RAID. *This objective may include but is not limited to:* RAID 0, RAID 1, RAID 5, RAID 10 and combinations; hardware and software RAID.

**Preparation Details****Prerequisite student experiences and knowledge**

This MTA Certification Exam Review lesson is written for students who have learned about Windows® Server Administration fundamentals. Students who do not have the prerequisite knowledge and experiences cited in the objective will find additional learning opportunities using resources such as those listed in the Microsoft® resources and Web links at the end of this review lesson.

Students should have an understanding of various storage devices and options.

Students should have a fundamental understanding of the different type of RAID configurations.

**Instructor preparation activities**

- Make copies of Student Activity WinServerFund\_SA\_4.1\_4.2
- If available, have a hot-pluggable hard drive to pass around to the students for a visual aid. It is also beneficial if the classroom is configured with a server class machine containing either of the various storage technologies discussed in this lesson plan.

**Resources, software, and additional files needed for this lesson**

- WinServerFund\_PPT\_4.1\_4.2
- WinServerFund\_SA\_4.1\_4.2
- WinServerFund\_SA\_4.1\_4.2\_Key

**Teaching Guide****Essential Vocabulary**

**fiber channel (FC)**—a gigabit-speed network technology primarily used for storage networking.

**host bus adapter**—connects a host system (the computer) to other network and storage devices.

**Internet Small Computer System Interface (iSCSI)** —an Internet protocol (IP)-based storage networking standard in which remote data storage facilities are linked together. By carrying SCSI commands over IP networks, iSCSI is used to facilitate data transfers over intranets and to manage storage over long distances. iSCSI can be used to transmit data over local area networks (LANs), wide area networks (WANs), or the Internet and can enable location-independent data storage and retrieval.

**Network-Attached Storage (NAS)**—file-level computer data storage connected to a computer network providing data access to different client platforms.

**Redundant Array of Independent Disks (RAID)**—a data storage method in which data is distributed across a group of computer disk drives that function as a single storage unit. All the information stored on each of the disks is duplicated on other disks in the array. This redundancy ensures that no information will be lost if one of the disks fails. RAID is generally used on network servers where data accessibility is critical and fault tolerance is required.

**Serial Advanced Technology Attachment (SATA)**—a computer bus interface for connecting host bus adapters to mass storage devices such as hard disk drives and optical drives. Serial ATA was designed to replace the Parallel ATA (AT Attachment) standard (also known as Enhanced Integrated Drive Electronics [EIDE]). Serial ATAs are able to use the same low level commands, but serial ATA host-adapters and devices communicate via a high-speed serial cable over two pairs of conductors. In contrast, parallel ATA used 16 data conductors, each operating at a much lower speed.

**Small Computer System Interface (SCSI)**—a set of standards that defines how to physically connect and transfer data between computers and peripheral devices. The SCSI standards define commands, protocols, and electrical and optical interfaces. SCSI is most commonly used for hard disks and tape drives, but it can connect a wide range of other devices, including scanners and CD drives.

## **Lesson Sequence**

### **Activating prior knowledge/lesson staging (Anticipatory Set: 10 minutes)**

1. Student prompt (see PowerPoint® slide 3): On a sheet of paper answer the following questions:
  - 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
2. Give students a few minutes to respond, allowing them to work until they have finished.
3. As time permits, call on a few students to report to the group with their responses.

### **Lesson activity (40 minutes)**

1. Teacher Instruction (20 minutes)
  - Use the included PowerPoint® slideshow to review various storage technologies and RAID options.
  - At the end of the slideshow, ask the students answer the Review Questions. Small-group discussions or a “think-pair-share” approach may be beneficial.
    - Show the question and give the students 1 minute to process the question and come up with answers.
    - Then give the students 2 minutes to discuss answers with a partner.
    - Finally, have each pair of students share their answers with the whole group.
    - Repeat for each additional review question.
2. Guided Practice (20 minutes)
  - Students complete WinServerFund\_SA\_4.1\_4.2, answering questions regarding storage technologies and RAID solutions.
  - If time allows, you may review all or part of the worksheet.

### **Assessment/lesson reflection (10 minutes)**

1. At the bottom of the page, tell students to write any questions they have or any topics about which they would like more assistance.
2. After class, look through the student responses and follow up with any student requiring additional help.

**Microsoft resources and Web links**

- **Microsoft: RAID**  
*[http://msdn.microsoft.com/en-us/library/ms184252\(SQL.90\).aspx](http://msdn.microsoft.com/en-us/library/ms184252(SQL.90).aspx)*
- **Microsoft: RAID Levels and SQL Server**  
*[http://msdn.microsoft.com/en-us/library/ms190764\(SQL.90\).aspx](http://msdn.microsoft.com/en-us/library/ms190764(SQL.90).aspx)*
- **Wikipedia: iSCSI**  
*<http://en.wikipedia.org/wiki/ISCSI>*
- **Wikipedia: Network Attached Storage**  
*[http://en.wikipedia.org/wiki/Network-attached\\_storage](http://en.wikipedia.org/wiki/Network-attached_storage)*
- **Wikipedia: SCSI**  
*<http://en.wikipedia.org/wiki/SCSI>*
- **Wikipedia: Serial ATA**  
*[http://en.wikipedia.org/wiki/Serial\\_ATA](http://en.wikipedia.org/wiki/Serial_ATA)*
- **Wikipedia: Storage Area Network**  
*[http://en.wikipedia.org/wiki/Storage\\_Area\\_Network](http://en.wikipedia.org/wiki/Storage_Area_Network)*

**Suggested best practices**

- If available, it is beneficial to have a rack server system to use as a visual aid. If one isn't available, try to have a hot-pluggable drive to pass around the classroom. Most hot pluggable drives are either SAS or SCSI.
- Establish a dialogue with the students regarding the various drive types. Have students describe how they have systems configured at home. Do they have a RAID solution? Do they know they can configure RAID 1 through Microsoft Windows?