Repair Linux File System Repair In this reading, you will learn how to use the file system consistency check or **fsck** command to repair data corruption in file systems on Linux machines. As an IT Support specialist, you will most likely encounter instances of data corruption in onsite systems. It is critical for you to know how to recover corrupted data, file systems, and hard drives. A computer file system is software that provides structure for storing the operating system (OS) and all other software installed on system hard drives. A hard drive must be formatted with a file system before the operating system can be installed. Since Linux is an open source OS, innovators have created nearly 100 file systems that support Linux OS installations. Several common file systems that are used for Linux systems include ext, ext2, ext3, ext4, JFS, XFS, ZFS, F2FS, and more. Like all software, software-based computer file systems can experience corruption. File system corruption can impede the computer's ability to locate files stored on the hard drive, including important OS files. File locations are stored as inodes (index nodes) in Linux. Every file in a Linux system has its own i-node identifier. The i-node stores metadata about the storage block and fragment location(s) where each file is stored. The i-node metadata also holds information about the file type, size of the files, file permissions, links to the file, and more. Symptoms of data corruption Symptoms of data corruption can include: System suddenly shuts down • Software program will not launch or it crashes when opening a corrupted file. May also give an error message "File format not recognized" or "(file name) is not recognized" • Corrupted files and folders may no longer appear in the file system. • The operating system (OS) may report bad sectors when failing to execute commands. • Damaged platter-based hard drives can make clicking sounds or unusual vibrations. Causes of data corruption Data corruption on system hard drives and file systems can be caused by: Software errors Software errors can be any software event that interferes with normal hard disk read/write operations. • Viruses and malware can be designed to intentionally cause corruption to data. • Antivirus software can damage files if the software experiences problems while scanning or repairing the Hardware malfunctions Larger files are more likely to experience corruption than smaller files. Large files occupy more disk space, making them statistically more likely to cross a bad sector on the hard drive. • Hard drives that contain platters are at risk of experiencing malfunctioning read/write heads. Damaged heads can corrupt multiple files and directories in a single read/write transaction. Hard drives with moving • **Electrical damage** - Can happen when a power failure occurs while the system is writing data to a hard drive. Data corruption repair The most critical first step, after data corruption has been identified or suspected, is to shut down the affected hard drive(s). The reason for this step is to stop the cause of the corruption from writing to the hard drives. The longer the corruption activity continues, the more difficult recovering the data becomes. Precautions should be taken before powering up a corrupted hard drive to run repair tools. It is important to minimize any read/write operations on the disk other than those produced by data recovery tools. One method to prevent further damage could be to have a corrupted Linux system boot from an external device or network (PXE boot). An alternative method might be to attach the corrupted hard drive as an external hard drive to a healthy system running Linux. A hard drive adapter or drive docking station can be used to convert an internal drive into an external device. Before connecting a corrupted drive to a healthy system, the **automount** service must be disabled. The **fsck** command will not repair corruption on a mounted file system. In fact, mounting a corrupted file system can cause the healthy Linux system to crash. Although the corrupted file system should not be mounted, the device file for the corrupted hard drive in the /dev directory must be readable for the fsck command to access the drive. The **fsck** command **Important Warning:** The **fsck** command should NOT be used: on a hard drive that was a member of a RAID array. on a mounted file system (must be unmounted). An important command line data recovery tool offered in the Linux operating system is the **fsck** command. It should be run anytime a Linux system malfunctions. The **fsck** command can check the file system and repair some, but not all, inconsistencies found. In some cases, **fsck** may recommend deleting a corrupted file or directory. The default setting for the **fsck** command is to prompt the user to approve or deny the repair of any problems found. The user running the fsck command must have write permissions for the corrupted file or directory to be able to approve a repair. If the user does not choose to repair inconsistencies found, the file system will remain in a corrupted state. The **fsck** command will check for inconsistencies and and prompt the user to make decisions on whether or **fsck** should repair for the following problems: Block count is not correct Blocks and/or fragments that are: allocated to multiple files illegally allocated • Block and/or fragment numbers listed in i-node metadata that are: overlapping out of range marked free in the disk map corrupted • Map inconsistencies on the disk or in the i-node. Directory: o contains references to a file but that number does not equal the number of links listed in the same file's inode metadata. sizes are not multiples of 512 The following checks are not run on compressed file systems. Directory checks: Directories or files that cannot be located or read. • The i-node map has an i-node number marked as being free in the directory entry. • The i-node number in the metadata is out of range. • The . (current directory) or .. (parent directory) link is missing or does not point to itself. • Any fragments that are not listed as the last address of the file in an i-node metadata file. How to use the fsck command 1. Enter **fsck** as a command line instruction. Syntax: fsck [<u>-n</u>] [<u>-p</u>] [<u>-y</u>] [<u>-f</u>] [FileSystem1name - FileSystem2name ...] • The **-n** flag - Sends a "**no**" response to all **fsck** questions and does not allow **fsck** to write to the drive. • The -p flag - Prevents error messages for minor problems from displaying while automatically fixing those minor errors. Outside of recovering from data corruption, it is a best practice to run the **fsck** -**p** command regularly at startup as a preventative measure. • The **-y** flag - Sends a "**y**es" response to all **fsck** questions to automatically attempt to repair all inconsistencies found. This flag should be reserved for severely corrupt file systems only. • The **-f** flag - Runs a **f**ast check that excludes file systems that were successfully unmounted for shutdown before the system crashed. • FileSystem#name - If you do not specify a file system, the **fsck** command checks all file systems in /etc/filesystems, where the check attribute is set to true. • To see more advanced flags, use the **man fsck** command. a. To have the **fsck** command check all of the default file systems and prompt the user on how to handle each inconsistency found, simply enter at a command line: b. For ext, ext2, ext3, and ext4 file systems, the **e2fsck** command can be used: c. To have the **fsck** command check specific file system(s) and automatically fix any inconsistencies found, enter: 2. The **fsck** command outputs an exit value, or code, when the tool terminates. The code is the sum of one or more of the following conditions: • 0 = All scanned file systems have been restored to a functional state. • 2 = **fsck** did not finish checks or repairs due to an interruption. • 4 = File system has changed and the computer needs to be rebooted. • 8 = **fsck** could not repair some or all file system damage. How to run **fsck** on the next boot or reboot In many Linux OS distributions, the **fsck** utility will automatically run at boot under certain circumstances, including: • When a file system has been labeled as "dirty", meaning that data scheduled to be written to the file system is different from what was actually written or not written to the disk. This could occur if the system shut down during a write operation. • When a file system has been mounted multiple times (can be set to a specific value) without a file system check. Configuring the **fsck** command to run automatically on boot and reboot differs depending on which brand and version of Linux is installed on the system. As a root or sudo user, use vi (visual instrument) to add the **fsck** command to the boot sequence. 1. In Debian and Ubuntu, a. Edit the **rcS** file. b. Add the following command to the **rcS** file: 2. In CentOS, a. Create or edit a file named autofsck. b. Add the following command to the autofsck file: Mark as completed \triangle Like \bigcirc Dislike \square Report an issue

Supplemental Reading for Linux Filesystem

Filesystem Types

38 sec

10 min

2 min

6 min

Windows

10 min

37 sec

5 min

10 min

10 min

2 min

Video: Module Introduction

Video: Review of Filesystems

FAT32 File System

Reading: Supplemental Reading for

(Video: Disk Partitioning and File System Essentials

(b) Video: Windows: Disk Partitioning and Formatting a Filesystem

Reading: Supplemental Reading for

(>) Video: Windows: Mounting and Unmounting a Filesystem

(>) Video: Linux: Disk Partitioning and

Formatting a Filesystem

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Reading: Supplemental reading Mounting and Unmounting a

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Filesystem in Linux

(>) Video: Windows: Swap

Windows Paging

Video: Linux: Swap

Linux Swap 10 min

Video: Windows: Files

NTFS File System

Video: Linux: Files

Video: Windows: Disk Usage

Windows Disk Usage

Video: Linux: Disk Usage

Linux Disk Usage 10 min

Reading: Supplemental Reading for

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Video: Windows: Filesystem Repair

Video: Linux: Filesystem Repair

Discussion Prompt: Disk

9 questions

Graded Assessments

Practice Quiz: Filesystem Types

Reading: Module 4 Glossary

Video: Ben: The power of computers

Reading: Supplemental Reading for Linux Filesystem Repair

10 min

Disk Partitioning and Formatting in

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