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| Lanzhou University of Technology |

**《GNU/Linux操作系统》实验报告**

实验三: **3.6.Exercises——About files and the file system**

**院(系):计算机与通信学院**

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**20年月日**

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| **《GNU/Linux操作系统》实验报告** | | | | | |
| 题目 | 3.6.Exercises——About files and the file system | 姓名 |  | 学号 |  |
| Ⅰ.Purpose of the experiment:  1.熟悉GNU/Linux操作系统：通过GNU/Linux基本操作实验，我们可以熟悉GNU/Linux操作系统的基本界面、命令行操作和文件系统结构，了解GNU/Linux的特点和优势。  （Familiarity with the GNU/Linux operating system: Through the GNU/Linux Basic Operating Experiment, We are familiar with the basic interface, command-line operations, and file system structure of the GNU/Linux operating system, Learn about the features and benefits of GNU/Linux.）  2.培养操作和管理技能：通过GNU/Linux基本操作实验可以帮助我们掌握GNU/Linux的基本命令，如文件和目录管理、权限管理、进程管理、软件安装和配置等技能，从而能够在GNU/Linux环境下进行常见的操作和管理任务。  （Develop operational and management skills: The GNU/Linux Basic Operations Experiment can help us master the basic GNU/Linux commands, such as file and directory management, rights management, process management, software installation and configuration, to enable common operational and administrative tasks in the GNU/Linux environment.）  3.理解GNU/Linux安全性：通过Linux基本操作实验可以帮助我们了解GNU/Linux的安全性特点，如用户和权限管理，以及如何保护系统免受潜在威胁的影响。  （Understanding GNU / Linux Security: Basic Linux operating experiments can help us understand GNU / Linux security features, such as user and rights management, and how to protect the system from potential threats.） | | | | | |
| II. Experimental Environment：  Software Environment: Raspberry Pi OS (64-bit)    Hardware Environment: Raspberry Pi 3 Model B+ | | | | | |
| III. Experimental Content：  However, the following experiments are all conducted on the command line, so here I use SSH tools (such as Xshell) instead of GUI operations.  i. Partitions  1. On which partition is your home directory?  df -h, run this command to find out where your home directory is located on the system.  2. How many partitions are on your system?  Lsblk, use this command to see a list of all partitions on your system.  3. What is the total size of your Linux installation?  df -h /, execute this command to check the overall size of your Linux installation.  ii Paths  1. Display your search path.  echo $PATH, Use this command to see the directories where the system looks for executable files.  2. Export a senseless path and try listing directory content.  export PATH=blah  ls, try this to experiment with changing the search path and see how it affects the ability to list directory content.  Here, because there is no ‘blah' in the environment, it leads to the situation that the system can't find any basic commands, such as ‘ls’.  3. What is the path to your home directory? How would another user reach your home directory starting from his own home directory, using a relative path?  echo $HOME  cd ~  Use these commands to learn your home directory path and see how another user can navigate to your home using a relative path.  4. Go to the tmp directory in /var. Now go to share in /usr using only one command. Change to doc. What is your present working directory?  cd /var/tmp  cd /usr/share/doc  pwd  Execute these commands to move between directories and find your current location.  iii. Tour of the system  1. Change to the /proc directory.  cd /proc, Navigate to the /proc directory to explore information about the system.  2. What CPU(s) is the system running on?  cat cpuinfo  Use this command to find details about the CPU(s) your system is using.  3. How much RAM does it currently use?  cat meminfo | grep "MemTotal"  Check the total RAM usage with this command.  4. How much swap space do you have?  cat meminfo | grep "SwapTotal"  Use this to see the total swap space on your system.  5. What drivers are loaded?  lsmod  List loaded drivers with this command.  6. How many hours has the system been running?  uptime  Check how long the system has been running with this command.  7. Which filesystems are known by your system?  cat filesystems  Explore filesystem information using this command.    8. Change to /etc/rc.d | /etc/init.d | /etc/runlevels and choose the directory appropriate for your run level.  cd /etc/rc.d or cd /etc/runlevels  Go to the specified directory to understand run levels.  9. What services should be running in this level?  ls, list services running in the chosen run level.  10. Which services run in graphical mode that don't run in text mode?  systemctl status lightdms  Raspberry pie uses' light DM', so you can use the above command to view the service that runs correctly graphically.  11. Change to /etc  cd /etc, navigate to the /etc directory.  12. How long does the system keep the log file in which user logins are monitored?  cat login.defs | grep "LOG\_FILE"  Use this command to find the duration for which user logins are logged.  13. Which release are you running?  cat os-release  Check the release information of your Linux system.  Because raspberryOS is based on Debian, it is shown here as Debian.  14. Are there any issues or messages of the day?  cat issue  cat motd  Read system messages and issues with these commands.  15. How many users are defined on your system?  cat passwd | wc -l, count the number of users on your system using this command.  16. How many groups?    cat group | wc -l  Count the number of groups on your system.  17. Where is the time zone information kept?  ls /usr/share/zoneinfo  Explore the time zone information directory.  18. Are the HOWTOs installed on your system?  ls /usr/share/doc/HOWTO  Check for installed HOWTOs with this command.  The streamlined raspberry OS obviously doesn't have a built-in directory that doesn't necessarily include/usr/share/doc/howto. Usually, the documentation of Linux system and HOWTOs (such as HOWTO guide) are provided in the form of software packages, which are not necessarily installed in this path.  19. Change to /usr/share/doc.  cd /usr/share/doc  Move to the specified directory.  20. Name three programs that come with the GNU coreutils package.  ls coreutils  List three programs from the GNU coreutils package using this command.  21. Which version of bash is installed on this system?  bash –version  Check the installed version of bash.  IV. Manipulating files  1. Create a new directory in your home directory.  mkdir new\_directory  Make a new directory in your home directory using this command.  2. Can you move this directory to the same level as your home directory?  mv new\_directory ../  Move the directory to the same level as your home directory with this command.  3. Copy all XPM files from /usr/share/pixmaps to the new directory. What does XPM mean?  cp /usr/share/pixmaps/\*.xpm new\_directory/  Copy XPM files to the new directory and explore what XPM means.  4. List the files in reverse alphabetical order.  ls -r  View files in reverse alphabetical order using this command.  5. Change to your home directory. Create a new directory and copy all the files of the /etc directory into it. Make sure that you also copy the files and directories which are in the subdirectories of /etc! (recursive copy)  cd ~  mkdir etc\_copy  cp -r /etc/\* etc\_copy/  Navigate to your home directory, create a new directory, and copy the contents of /etc (including subdirectories) to it.  6. Change into the new directory and make a directory for files starting with an upper case character and one for files starting with a lower case character. Move all the files to the appropriate directories. Use as few commands as possible.  cd etc\_copy  mkdir uppercase lowercase  mv [A-Z]\* uppercase/  mv [a-z]\* lowercase/  Go to the new directory, create folders for uppercase and lowercase files, and move files accordingly using minimal commands.    7. Remove the remaining files.  rm -r \*  Delete the remaining files in the current directory.  8. Delete the directory and its entire content using a single command.  rm -r etc\_copy  Remove the directory and its contents in one go.  9. Use grep to find out which script starts the Font Server in the graphical run level.  grep -r "Font Server" /etc/rc.d  Find the script starting the Font Server in the graphical run level using grep.  Raspberry pie can't achieve this goal through' grep-r "font server"/etc/rc1.d', so the' systemctl list-units-type = service-state = active | grepfont' command is used here to achieve the goal.  10. Where is the sendmail server program?  which sendmail  Locate the sendmail server program on your system.  11. Make a symbolic link in your home directory to /var/tmp. Check that it really works. Make another symbolic link in your home directory to this link. Check that it works. Remove the first link and list directory content. What happened to the second link?  ln -s /var/tmp ~/my\_var\_tmp && cd ~ && ln -s my\_var\_tmp my\_var\_tmp\_second && rm my\_var\_tmp && ls  V. File permissions  1. Can you change file permissions on /home?  sudo chmod 755 /home  Change file permissions for /home using this command.  2. What is your standard file creation mode?  umask  Check the standard file creation mode (umask) on your system.  3. Change ownership of /etc to your own user and group.  sudo chown -R your\_user:your\_group /etc  Change ownership of /etc to your own user and group using this command.  4. Change file permissions of ~/.bashrc so that only you and your primary group can read it.  chmod 640 ~/.bashrc  Modify file permissions of ~/.bashrc to restrict read access to only you and your primary group.  5. Issue the command `locate root`. Do you notice anything special?  locate root  Because the operating system I use is raspberry OS, using the' locate root' command will directly report an error: "-bash: locate: command not found".  6. Make a symbolic link to /root. Can it be used?  ln -s /root ~/my\_root  cd my\_root  Found that this can not be used. | | | | | |
| IV. Experiment summary and experience  Exploring Linux Commands  In this experiment, I engaged in a series of hands-on activities to explore and interact with various Linux commands. The tasks covered fundamental aspects of the Linux operating system, including partitions, file paths, system directories, and file manipulation. Here's a summary of the key experiences and lessons learned:  1. Partition Exploration:  I began by examining the partition information on my system using commands such as `df -h` and `lsblk`. This provided insights into the location of my home directory, the number of partitions, and the total size of my Linux installation.  2. Path Manipulation:  I explored the concept of file paths by displaying my search path with `echo $PATH`. Additionally, I experimented with exporting a senseless path and observed its impact on listing directory contents using the `ls` command.  3. System Tour:  Navigating through the `/proc` directory, I gathered information about the system's CPU, RAM usage, swap space, loaded drivers, uptime, and filesystems. Further exploration led me to investigate run levels, services running in graphical mode, and system details stored in directories like `/etc` and `/usr/share/doc`.  4. File Manipulation:  I honed my file manipulation skills by creating, moving, copying, and organizing directories and files. Tasks such as copying specific file types, listing files in reverse order, and performing recursive copies deepened my understanding of Linux file operations.  5. File Permissions:  I delved into file permissions, changing them on specific directories, exploring the standard file creation mode (`umask`), and modifying ownership and permissions of individual files.  6. Symbolic Links:  Symbolic links were introduced through tasks involving creating links to directories, verifying their functionality, and observing the behavior when links are removed.  7. Experience and Insights:   * Adaptability: Adjusting commands based on the specific directory structure of the system was crucial for success. Linux systems may have variations in their file organization, requiring flexibility in command usage. * Command Familiarity: This experiment reinforced the importance of becoming familiar with essential Linux commands. Regular use and experimentation contribute to a deeper understanding of the command-line interface. * Documentation is Key: The emphasis on reading documentation, particularly man pages, proved valuable. It not only provided command syntax but also unveiled additional functionalities. * Caution in Execution: Performing file manipulation and system exploration commands requires caution, especially when using commands that modify or delete files. Understanding the consequences of each command is essential.   Overall, this experiment provided a practical and insightful journey into the world of Linux commands. It enhanced my confidence in navigating the Linux environment and executing commands effectively, laying a solid foundation for further exploration and learning. | | | | | |