“Київський фаховий коледж зв’язку”

Циклова комісія комп’ютерної інженерії

**ЗВІТ ПО ВИКОНАННЮ**

**ЛАБОРАТОРНОЇ РОБОТИ №4**

з дисципліни “Операційні системи”:

**Тема: “Команди Linux для управління процесами”**

Виконали студенти

групи РПЗ-13А та РПЗ-13Б

Eleven Two Zeroes:

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Робота студентів групи РПЗ-13А та РПЗ-13Б Eleven Two Zeroes: Vlad Sapozhnyk, Max Karpenko and Dmytro Onufriiev.

**Мета роботи:**

1. Отримання практичних навиків роботи з командною оболонкою Bash.
2. Знайомство з базовими командами для управління процесами.

**Матеріальне забезпечення занять:**

1. ЕОМ типу IBM PC.
2. ОС сімейства Windows та віртуальна машина Virtual Box (Oracle).
3. ОС GNU/Linux (будь-який дистрибутив).
4. Сайт мережевої академії Cisco netacad.com та його онлайн курси по Linux.

**Завдання для попередньої підготовки: *Created by Vlad Sapozhnyk***

**1. \*Прочитайте короткі теоретичні відомості до лабораторної роботи та зробіть невеличкий словник базових англійських термінів з питань призначення команд та їх параметрів.**

Glossary of terms

| Command | Команда |
| --- | --- |
| Signal | Сигнал |
| Process | Процес |
| Root User | Root користувач |
| Terminate | Припинити |
| PID (Process ID) | ID процесу |
| Kill the process | Вбити процес |
| Utilization | Утилізація |
| Swap Space | Процес обміну |

**2. На базі розглянутого матеріалу дайте відповіді на наступні питання:**

**2.1. \*Які команди для моніторингу стану процесів ви знаєте. Як переглянути їх можливі параметри?**

| Name of the command | What command can do |
| --- | --- |
| top | The top command is used to monitor active processes in UNIX systems. It dynamically displays a list of processes, updating information in real time. |
| ps | The ps command (short for "process status") is used to display information about running processes in Unix-like operating systems. |
| pstree | pstree is used to display running processes in the form of a tree. |

**2.2. \*Чи може команда ps у реальному часі відслідковувати стан процесів?**

No, the ps command cannot monitor the status of processes in real time.

**2.3. \*\*За якими параметрами можливе сортування процесів в команді top? Як переключатись між ними?**

By default, when you start top, it sorts the processes based on the %CPU value. You can change the sort order by using one of several interactive commands while top is running. Each interactive command is a single character that you can press while top is running and changes the behavior of the program. Pressing f allows you to select the field to use to sort the output, and pressing d allows you to change the polling interval.

**2.4. \*\*Які команди для завершення роботи процесів ви знаєте?**

kill - the kill command is used to send signals to processes.

killall - The killall command is a powerful way to stop processes by using their names rather than the PID numbers.

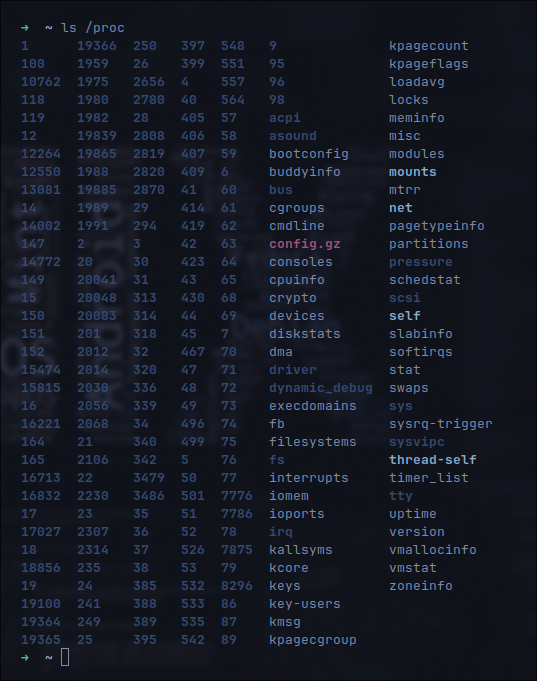
**Хід роботи. *Created by Max Karpenko***

**1. Початкова робота в CLI-режимі в Linux ОС сімейства Linux:**

**1.3. Запустіть свою операційну систему сімейства Linux (якщо працюєте на власному ПК та її встановили) та запустіть термінал.**

**2. Дайте відповіді на наступні питання:**

* **Як вивести вміст директорії /proc? Де вона знаходиться та для чого призначена? Охарактеризуйте інформацію про її вміст?**

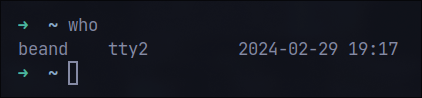
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The /proc directory is located at the root of the Linux file system and is a virtual file system that does not take up disk space. It is designed to provide information about system resources and processes running in the operating system.

**The contents of /proc contain dynamic information about the system, such as:**

1. CPU details (/proc/cpuinfo),
2. Memory usage (/proc/meminfo),
3. Process information (directories named after their PIDs),
4. Kernel parameters, etc.

* **Як вивести інформацію про поточні сеанси користувачів. Якою командою це можна зробити?**

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To display information about current user sessions in Linux, you can use the who command. This command displays a list of all users who are currently logged in to the system, along with information about the time they logged in, the terminal they connected from, and the IP address or hostname (in the case of remote access).

* **Які дії можна зробити в терміналі за допомогою комбінацій Ctrl + C, Ctrl + D та Ctrl + Z?**

1. **Ctrl + C:** Most often used to interrupt the execution of the current command or program in the terminal. This keyboard shortcut sends a SIGINT signal to the current process, which causes it to stop executing immediately. For example, if a command is taking too long and you want to stop it, you can use Ctrl + C.
2. **Ctrl + D:** Used to send an EOF (End of File) signal to the current terminal session. In the context of a shell, this means closing the input stream, which is often used to close a shell session or to end input in interactive programs that read input from the terminal. For example, if you enter the cat command without arguments, it will wait for input from the keyboard; entering Ctrl + D will tell cat that the input is complete.
3. **Ctrl + Z:** Used to temporarily pause the execution of the current command or program. This keyboard shortcut sends a SIGTSTP signal to the current process, which stops its execution and returns you to the shell. The process remains on the system as stopped, and you can continue its execution in the background or foreground with the bg (background) and fg (foreground) commands, respectively.

* **\*Чим відрізняється фоновий процес від звичайного. Де вони використовуються?**

**The normal process:** This is the process that runs in the foreground of the terminal. It receives input from the keyboard and sends the output to the terminal screen. The user can see its output on the screen and interact with it.

**Background process:** This is a process that runs in the background, that is, without being attached to the terminal. It does not display its output on the terminal screen, so the user does not see its output and cannot interact with it directly from the keyboard. Background processes are often used to perform tasks that take a lot of time or resources and do not require active user participation. For example, a script that processes large files can be run in the background so that the user can continue working on other tasks in the terminal.

Background processes are often started using special terminal characters, such as **&**, which allows you to run commands without locking the terminal, or using the key combination **Ctrl + Z** and the bg command, which puts a paused process into the background.

* **\*Опишіть наступні команди та поясніть що вони виконують – команда jobs, bg, fg.**

*The jobs, bg, and fg commands are built-in shell commands in Unix-like operating systems such as Linux. They are used to control tasks (processes) running in the terminal. Here are their main functions:*

**1. jobs**

The jobs command displays a list of all the tasks that have been running in the current shell session. It shows the status of each task (for example, whether it is running in the background, stopped, etc.) and gives each task a unique number. These numbers can be used with the bg and fg commands to identify specific tasks.

**2. bg**

The bg command is used to resume execution of a stopped process in the background. If you use bg without arguments, it will try to put the last stopped task in the background. You can also specify a specific job by using the job number, which can be found using the jobs command.

**3. fg**

The fg command is used to resume execution of a stopped process in the foreground. This means that the process will be attached to the terminal and the user will be able to interact with it again. As with the bg command, if you use fg without arguments, it will try to bring the last stopped task to the foreground. The command also allows you to specify a specific task by the number obtained from jobs.

* **\*\*Якою командою можна переглянути інформацію про запущені в системи фонові процеси та задачі?**

**ps:** The ps command is used to display information about active processes. You can use various options from ps to customize the output. For example, ps aux will show a complete list of processes running on the system, including background processes.

**jobs:** As already mentioned, the jobs command displays a list of tasks that have been started from the current terminal. It will show both stopped (suspended) and background tasks that are currently running.

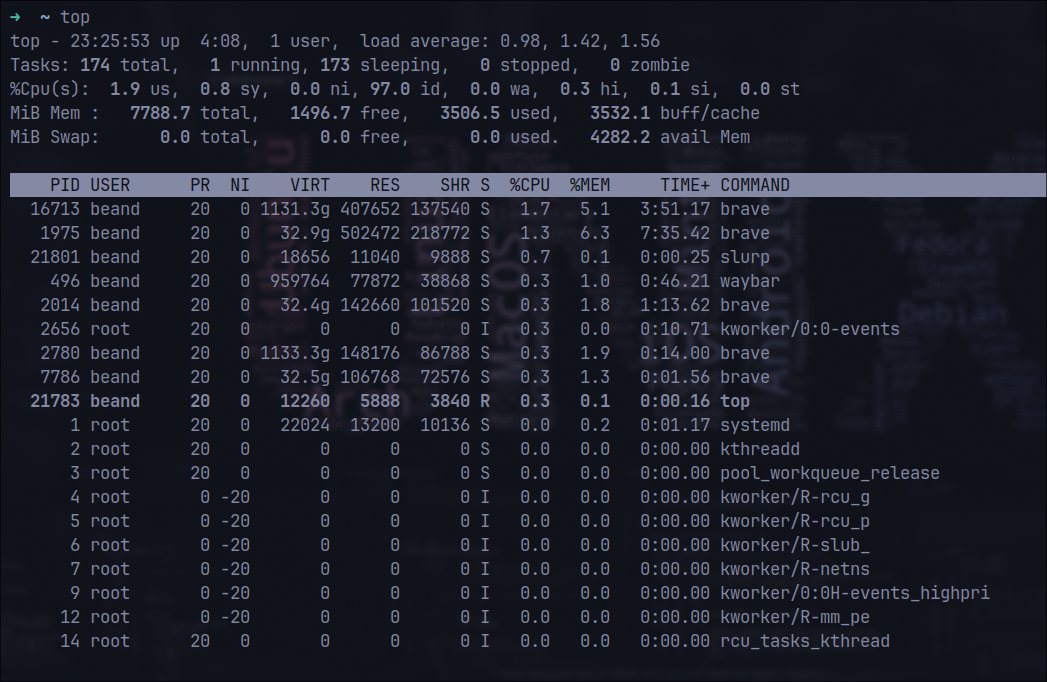
**top or htop (extended version):** These programs provide a dynamic view of active processes on the system. They show detailed process statistics, including CPU and memory usage, and allow users to manage processes in real time. While top is a standard utility on most systems, htop may require a separate installation but provides a more user-friendly interface.

* **\*\*Як призупинити фоновий процес, як його потім відновити та при необхідності перезапустити?**

To pause a background process, you first need to find its number using the command that shows active processes, and then use the stop command, specifying this number. To resume a process, you can use the command to continue running the process in the background or move it back to the foreground. If you need to restart a process, you first stop it and then restart it again with the same parameters that were used when it was first started.

**3. Запустіть термінал, та в командному рядку виконайте наступні дії для ознайомлення з роботою з процесами:**

1. **запустіть команду top, проаналізуйте отриманий в цій команді результат та охарактеризуйте найбільш активні процеси у системі;**

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*Based on the output of the top command, we can make the following observations about the most active processes in the system:*

**Brave Browser:** Processes named brave occupy several positions in the list, showing high CPU and RAM usage. This indicates that the Brave browser is being actively used and may have many tabs open or be performing resource-intensive tasks. In particular, two Brave processes use 3.7% and 2.3% of CPU respectively, as well as significant amounts of RAM.

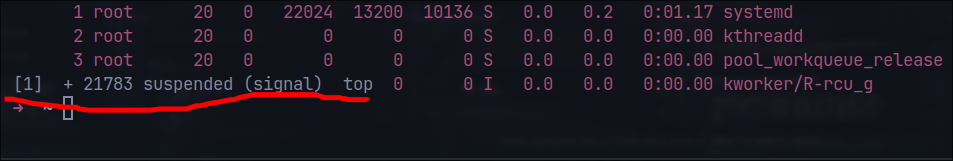
**Waybar:** The waybar process uses 0.7% CPU and 1.0% RAM, which is a relatively low load. Waybar is a status bar for Wayland and its activity is usually not very high.

**Telegram Desktop:** The telegram-desktop process is also among the active ones, using 0.3% of CPU and 9.2% of RAM. This indicates the active use of the messenger.

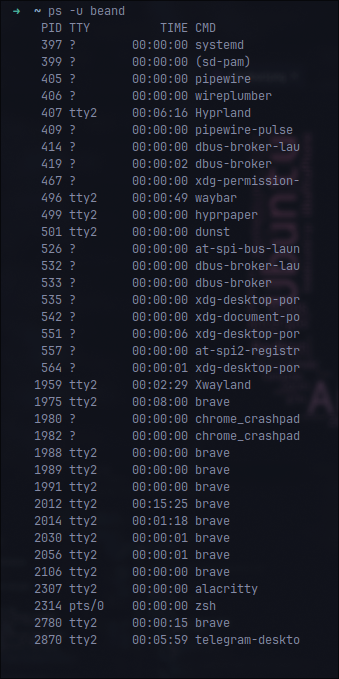
**System processes:** Processes such as kworker/u17:1-i915\_flip and kworker/2:1H-events\_highpri with a small CPU usage (0.3%) are part of the Linux kernel and perform background tasks related to hardware management and system events.

**The top command:** The top command itself, which is used for monitoring, also appears in the list, using 0.3% of the CPU. This is normal because top is actively updating system process data in real time.

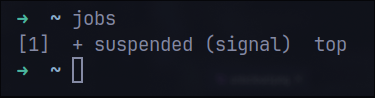
1. **призупинити виконання команди top (треба використати комбінацію клавіш);**

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1. **вивести інформацію про процеси за допомогою команди ps;**

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1. **\*наведіть 5 прикладів з використанням різних параметрів команди ps (наприклад, вивести тільки системні процеси, вивести процеси конкретного користувача, вивести процесів тощо). Опишіть, що саме роблять обрані Вами параметри**
   1. **Log all processes of the system:** ps -e
   2. **Display processes of a specific user:** ps -u <user>
   3. **Print the process tree:** ps -ejH
   4. **Display processes with a specific identifier (PID):** ps -p <PID>
   5. **Print system processes:** ps -e --deselect -N T
2. **\*\*передивіться чи є у Вас запущені фонові процеси, які саме?**

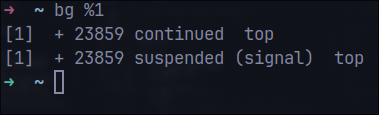
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1. **\*\*відновити виконання призупиненого фонового процесу спочатку у позиції “на передньому плані” (foreground), потім ще раз його призупинити, а потім відновити його виконання у позиції “на задньому плані” (background)**

**Resume execution of a paused process in the foreground:** fg %1

**Pause the process in the foreground again:** ctrl + z

**Resume a paused process in the background:** bg %1



1. **завершити роботу даного фонового процесу.**

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**Контрольнi запитання: *Created by Dmytro Onufriiev.***

**1. Яке призначення директорії /proc в системах Linux. Яку інформацію вона зберігає?**

It's a pseudo filesystem that contains information about processes (as name “proc” suggests) and provides information about system hardware and current kernel configuration.

**2. Як серед будь-яких трьох процесів динамічно визначати, який з них в поточний момент часу використовує найбільший обсяг пам'яті? Який відсоток пам’яті він споживає від загального обсягу?**

You can use commands such as ps, top, htop, that show current processes. Using command ps -eo pid,%mem --sort=-%mem | head -n 3 processes can be sorted by percent of memory usage.

**3. Як отримати ієрархію батьківських процесів в системах Linux? Наведіть її структуру та охарактеризуйте.**

There are several ways to get the hierarchy of parent processes. One of them is to use the pstree command. It displays the hierarchy of processes in the form of a tree, where parent processes are located at the top and children are located below them. It shows the relationship between processes in the hierarchical structure.

The structure of parent processes

init (PID 1): This is the first process that is created when the system boots. It is the parent process for all other processes.

systemd (PID 2): In modern initialization systems (such as Ubuntu), systemd acts as the parent process for many services and daemons.

bash (PID 1234): An example of a child process that can be a command line shell. It executes commands entered by the user.

**4. \*Чим відрізняється команда top від ps?**

| **top** | Used interactively (you can read help by pressing "h" while the command is running). | Displays process statistics continuously until you stop it. | Convenient for monitoring active processes. |
| --- | --- | --- | --- |
| **ps** | Designed for non-interactive use (scripts, getting information through the shell pipeline, etc.). | Provides a snapshot of current processes. | Displays information about CPU and memory usage. |

**5. \*Які додаткові можливості реалізує htop в порівнянні з top?**

* htop provides a colorful and interactive interface that makes it easy to observe processes
* htop allows horizontal and vertical scrolling, which is convenient for viewing a long list of processes
* htop displays processes in a tree structure, showing the dependencies between them
* htop allows you to use the mouse to select options and navigate between processes

**6. \*\*Опишіть компоненти вашої мобільної ОС для здійснення моніторингу запущених в системі процесів?**

MIUI has a built-in task manager that allows users to view active processes and the resources they are using. This manager allows you to quickly view and terminate processes.

**7. \*\*Чи підтримує Ваша мобільна ОС термінальне керування роботою процесів, опишіть як саме.**

MIUI supports terminal control of processes, but this is usually available through the developer interface, which is activated by enabling developer mode in the settings. Once developer mode is activated, you can access the command line or terminal through tools such as ADB (Android Debug Bridge) or through dedicated apps that allow you to execute commands directly on the device.

**8. \*\*Чи можливо поставити сторонні програмні засоби, що дозволяють організувати управління та моніторинг роботою процесів у Вашому мобільному телефоні. Коротко опишіть їх.**

Yes, it's possible to install third-party software to organize the management and monitoring of processes in MIUI. Some of them are available in the Google Play Store. The most popular are:

**Task Manager:** This is an application that allows to view and manage running processes on smartphone. It provides information about the memory, CPU, and battery usage of each process and allows to close or pause them.

**Greenify:** This is an application that helps effectively manage background processes and applications running in the background. It allows to "freeze" or "trample" applications that consume a lot of resources, thereby saving battery power and speeding up device.

**SystemPanel 2:** This is a powerful system monitoring tool that provides information about running processes, resource usage, and other system parameters. It allows to manage processes and applications by shutting down or pausing them as needed.