“Київський фаховий коледж зв’язку”

Циклова комісія комп’ютерної та програмної інженерії

**ЗВІТ ПО ВИКОНАННЮ**

**ЛАБОРАТОРНОЇ РОБОТИ №2**

**з дисципліни: «Операційні системи»**

Тема: “Знайомство з інтерфейсом та можливостями ОС Linux”

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**Тема: “Знайомство з інтерфейсом та можливостями ОС Linux”**

**Мета роботи:**

1. Знайомство з інтерфейсами ОС Linux.
2. Отримання практичних навиків роботи в середовищах ОС Linux та мобільної ОС – їх графічною оболонкою, входом і виходом з системи, ознайомлення зі структурою робочого столу, вивчення основних дій та налаштувань при роботі в системі

**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

**Короткі теоретичні відомості:**

**Getting to the Command Line**

The command line interface (CLI) is a simple text input system for entering anything from single-word commands to complicated scripts. Most operating systems have a CLI that provides a direct way of accessing and controlling the computer.

On systems that boot to a GUI, there are two common ways of accessing the command line—a GUI-based terminal, and a virtual terminal:

* A GUI terminal is a program within the GUI environment that emulates a terminal window. GUI terminals can be accessed through the menu system. For example, on a CentOS machine, you could click on Applications on the menu bar, then System Tools > and, finally, Terminal. If you have a search tools, you can search for terminal, as shown here.
* A virtual terminal can be run at the same time as a GUI but requires the user to log in via the virtual terminal before they can execute commands (as they would before accessing the GUI interface).

Each Linux desktop distribution is slightly different, but the application terminal or x-term will open a terminal window from the GUI. While there are subtle differences between the terms console and terminal window sessions, they are all the same from an administrators standpoint and require the same knowledge of commands to use.

Ordinary command line tasks are starting programs, parsing scripts, and editing text files used for system or application configuration. Most servers boot directly to a terminal, as a GUI can be resource intensive and is generally not needed to perform server-based operations.‌⁠​​

**Applications**

The kernel of the operating system is like an air traffic controller at an airport, and the applications are the airplanes under its control. The kernel decides which program gets which blocks of memory, it starts and kills applications, and it handles displaying text or graphics on a monitor. Applications make requests to the kernel and in return receive resources, such as memory, CPU, and disk space. If two applications request the same resource, the kernel decides which one gets it, and in some cases, kills off another application to save the rest of the system and prevent a crash. The kernel also abstracts some complicated details away from the application. For example, the application doesn’t know if a block of disk storage is on a solid-state drive, a spinning metal hard disk, or even a network file share. Applications need only follow the kernel’s Application Programming Interface (API) and therefore don’t have to worry about the implementation details. Each application behaves as if it has a large block of memory on the system; the kernel maintains this illusion by remapping smaller blocks of memory, sharing blocks of memory with other applications, or even swapping out untouched blocks to disk.

The kernel also handles the switching of applications, a process known as multitasking. A computer system has a small number of central processing units (CPUs) and a finite amount of memory. The kernel takes care of unloading one task and loading a new one if there is more demand than resources available. When one task has run for a specified amount of time, the CPU pauses it so that another may run. If the computer is doing several tasks at once, the kernel is deciding when to switch focus between tasks. With the tasks rapidly switching, it appears that the computer is doing many things at once. When we, as users, think of applications, we tend to think of word processors, web browsers, and email clients, however, there are a large variety of application types. The kernel doesn’t differentiate between a user-facing application, a network service that talks to a remote computer, or an internal task. From this, we get an abstraction called a process. A process is just one task that is loaded and tracked by the kernel. An application may even need multiple processes to function, so the kernel takes care of running the processes, starting and stopping them as requested, and handing out system resources.

**Major Applications**

The Linux kernel can run a wide variety of software across many hardware platforms. A computer can act as a server, which means it primarily handles data on others’ behalf, or as a desktop, which means a user interacts with it directly. The machine can run software or be used as a development machine in the process of creating software. A machine can even adopt multiple roles as Linux makes no distinction; it’s merely a matter of configuring which applications run. One resulting advantage is that Linux can simulate almost all aspects of a production environment, from development to testing, to verification on scaled-down hardware, which saves costs and time. A Linux administrator could run the same server applications on a desktop or inexpensive virtual server that are run by large internet service providers. Of course, a desktop would not be able to handle the same volume as a major provider would, but almost any configuration can be simulated without needing powerful hardware or server licensing.

Linux software generally falls into one of three categories:

**Server Applications:** Software that has no direct interaction with the monitor and keyboard of the machine it runs on. Its purpose is to serve information to other computers, called clients. Sometimes server applications may not talk to other computers but only sit there and crunch data.

**Desktop Applications:** Web browsers, text editors, music players, or other applications with which users interact directly. In many cases, such as a web browser, the application is talking to a server on the other end and interpreting the data. This is the “client” side of a client/server application.

**Tools:** A loose category of software that exists to make it easier to manage computer systems. Tools can help configure displays, provide a Linux shell that users type commands into, or even more sophisticated tools, called compilers, that convert source code to application programs that the computer can execute.

The availability of applications varies depending on the distribution. Often application vendors choose a subset of distributions to support. Different distributions have different versions of key libraries, and it is difficult for a company to support all these different versions. Some applications, however, like Firefox and LibreOffice are widely supported and available for all major distributions.

The Linux community has come up with lots of creative solutions for both desktop and server applications. These applications, many of which make up the backbone of the Internet, are critical to understanding, and utilizing the power of Linux. Most computing tasks can be accomplished by any number of applications in Linux. There are many web browsers, web servers, database servers, and text editors from which to choose. Evaluating application software is an important skill to be learned by the aspiring Linux administrator. Determining requirements for performance, stability, and cost are just some of the considerations needed for a comprehensive analysis.

**Завдання для попередньої підготовки.**

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

|  |  |
| --- | --- |
| Словник | |
| Server | Виконує сервісне П.З. |
| Software | Програмне забезпечення(П.З.) |
| GUI terminal | Віртуал графічного інтерфейсу |
| Virtual terminal | Віртуальний термінал |
| Application | Застосування |
| CPU | Центральний процесор |
| GPU | Графічний процесор |
| Server applications | Серверні програми |
| Desktop applications | Настільні програми |
| Tools | Інструменти |
| Open source | Відкритий код |

1. Вивчіть матеріали онлайн-курсу академії Cisco “NDG Linux Essentials”:

* Chapter 3 - Working in Linux
* Chapter 4 - Open Source Software and Licensing

1. Пройдіть тестування у курсі NDG Linux Essentials за такими темами:

* Chapter 03 Exam
* Chapter 04 Exam

1. \*\*Дайте визначення наступним поняттям:

* CLI-режим - is a way of interacting with a computer where the user enters text commands to perform tasks
* Термінал на основі графічного інтерфейсу користувача - It is a program that provides command line access (CLI) in a graphical environment.
* Віртуальний термінал - is a software environment that emulates the operation of a physical terminal.

1. Підготувати в електронному вигляді початковий варіант звіту:

* Титульний аркуш, тема та мета роботи
* Словник термінів
* Відповіді на п.4 з завдань для попередньої підготовки

**Хід роботи.**

* 1. Робота в графічному режимі в ОС сімейства Linux (робота з інтернет-джерелами):
  2. Оберіть графічну оболонку для ОС сімейства Linux, яку ви хочете розглянути ***(в 401 ауд. це Gnome)***. Розгляньте структуру робочого простору користувача, та опишіть основні його компоненти:
* Основне меню

The main menu in GNOME is called "Activities Overview". It is opened by pressing the "Activities" button in the upper left corner of the screen or by pressing the Super key (Windows). This menu contains the main workspace controls: Application launch bar, window for viewing running applications, search, desktop selection.

* Панелі швидкого доступу

The top panel contains the "Activities" button, time zone, system status (battery, network, sound), user menu (exit, reboot, settings). Notifications and quick settings are also displayed here

* Пошук

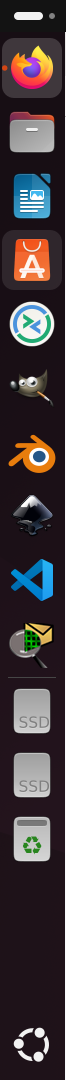
Search in GNOME is integrated into the Activities Overview.

* Доступ до нових робочих столів тощо

GNOME supports many desktops. Each desktop can contain separate programs and windows, which helps organize the workflow.

**Примітка:** Якщо ви обрали інший графічний інтерфейс то компоненти меню можуть бути іншими.

* 1. \*Запуск програм. Дослідіть можливості запуску додатків різними способами (описати спосіб і по-можливості показати скріншоти):
* Запуск програм через панель швидкого запуску
* The Dash is located on the left side of the screen in Activities Overview mode. This is one of the fastest ways to launch apps.



* Запуск програм через пошук в меню / глобальне меню

GNOME Search is integrated into the Activities Overview and allows you to quickly find and launch applications.

Изображение выглядит как снимок экрана, Мультимедийное программное обеспечение, программное обеспечение, текст

Контент, сгенерированный ИИ, может содержать ошибки.

* Запуск програм через віджет запуску

GNOME has a special launcher widget that can be opened by pressing Alt+F2. This method is useful for quickly launching programs or commands.



* 1. \*Вихід з системи та завершення роботи в Linux. Як виконати в графічному інтерфейсі наступні дії (наведіть скріни):
* Зміна користувача на root

write su root in the console

Изображение выглядит как текст, снимок экрана, Шрифт

Контент, сгенерированный ИИ, может содержать ошибки.

* Перезавантаження системи

Click on the user menu at the top right of the screen, and reboot. Whether to write a reboot in the console

Изображение выглядит как текст, гаджет, Мобильный телефон, мультимедиа

Контент, сгенерированный ИИ, может содержать ошибки.



* Вимкнення системи

Click on the user menu at the top right of the screen

Изображение выглядит как текст, гаджет, Мобильный телефон, мультимедиа

Контент, сгенерированный ИИ, может содержать ошибки.

1. \*\*Робота в середовищі мобільної ОС.
   1. Опишіть головне меню вашої мобільної ОС, який графічний інтерфейс вона використовує?

Android, based on a modified Linux kernel, is a mobile operating system developed by Google. Although Android is a free and open-source operating system, most of the software that comes with it (including Google apps and software from device manufacturers) is proprietary software.

Early versions of Android (1.0, 1.5, 1.6) were used exclusively on mobile phones. Android 2.x versions were mainly used on phones, but were also supported on some tablets. Android 3.0 was specifically designed for tablets and did not support running on mobile phones. Starting with Android 4.0, compatibility between phones and tablets has been unified. Currently, the latest version is Android 15, which was released on September 3, 2024.

Android uses a graphical interface called Material Design. The home screen usually consists of a collection of apps and widgets arranged on different screens. The user can navigate between these screens horizontally or vertically, depending on the settings. The home screen may also contain shortcuts to popular apps, a search bar, or other tools that the user can customize to their liking.

* 1. Опишіть меню налаштувань компонентів мобільного телефону.

• Wi-Fi – turn Wi-Fi on/off, search for and connect to available networks.

• Mobile network – mobile data settings, operator selection, network type (2G, 3G, 4G, 5G).

• Bluetooth – turn it on/off, search for and connect to devices.

• VPN – set up and connect a virtual private network.

• Hotspot and modem – create a Wi-Fi hotspot to distribute the Internet from your mobile device.

Devices and display:

• Screen – adjust the brightness, dark theme mode, change the resolution and wallpaper.

• Sound – adjust the volume of the call, media, notifications, as well as set up vibration and ringtones.

• Touch screen – calibrate the touch screen, set up gestures and touch sensitivity.

• Notifications and active bar – set up notifications.

• Desktop – set up the desktop.

Battery:

• Power saving modes – control modes to extend battery life.

• Battery usage – view applications that consume the most battery power.

Security and privacy:

• Screen lock – select a lock method: PIN, pattern, fingerprint, face.

• Data access – set permissions for applications.

• Phone encryption – enable data encryption on the device.

• Fingerprint, face data and device protection – unlock the phone using a fingerprint scanner, face or password.

• Safety and emergency services – notify you of danger and quickly call for help if possible

System:

• System update – check and install updates for the operating system.

• Language and input – select the interface language, keyboard settings, voice input.

• Backup and reset – set up automatic backup and reset the device to factory settings.

* 1. Використання комбінацій клавіш для виконання спеціальних дій.

Screenshot: Press the power button and the volume down button simultaneously.

Reboot: Press and hold the power button for a few seconds.

Bootloader: Press and hold the power button and the volume down button with the device turned off.

Google Assistant: Hold the side power button.

Recovery Mode: Press and hold the power button and the volume up button with the device turned off.

* 1. Вхід у систему та завершення роботи пристрою. Особливості налаштувань живлення батареї.

Turn on your device: Press the power button.

Unlock the screen:

Swipe up from the bottom of the screen.

If you have a password, PIN, or pattern, enter it.

You can also use your fingerprint or face recognition, if you have these features set up.

To log out, simply press and hold the power button for a few seconds until the power off menu appears on the screen. Then select "Power off."

Features of Android battery settings include:

Power saving modes: These modes limit the activity of applications in the background, reducing power consumption and extending the device's operating time. There are usually several modes with different levels of restriction.

Adaptive battery: This feature uses artificial intelligence to learn user habits and optimize the performance of applications. It can predict which applications are used less often and limit their background activity to save battery life.

Detailed battery usage statistics: Android provides information about which applications are consuming the most power, allowing the user to identify and optimize their performance.

Adjust screen brightness: Screen brightness is one of the main factors affecting power consumption. Android allows you to configure automatic brightness adjustment depending on the lighting, as well as set it manually.

**Контрольні запитання**

1. Наведіть приклади серверних додатків Linux для сервера баз даних, серверів розсилки повідомлень та файлообмінників.

MySQL/MariaDB: These are probably the most well-known open source relational databases. MySQL is widely popular and used in a variety of projects, from small websites to large enterprise systems. MariaDB, in turn, is a fork of MySQL, designed to maintain full compatibility and provide a more open license. Both databases offer a wide range of features, including support for transactions, indexes, and various data types.

PostgreSQL: This powerful object-relational database is known for its reliability, advanced features, and compliance with SQL standards. PostgreSQL is often used in projects that require high performance, complex queries, and support for advanced data types such as JSON and GIS.

SQLite: If you need a lightweight and easy-to-use database, SQLite is a great choice. It does not require separate server software and stores data in a file on disk, making it ideal for embedded solutions, mobile applications, and small projects where scalability is not required.

1. Порівняйте оболонки Bourne, C, Bourne Again (Bash), the tcsh, Korn shell (Ksh) та zsh.

Bourne shell (sh): One of the oldest shells, simple but has limited features.

C shell (csh): Has syntax similar to C, supports interactive features, but is less stable.

Bourne Again shell (Bash): An enhanced version of the Bourne shell, supports scripting, command history, autocompletion.

tcsh: An enhanced version of the C shell with additional features such as autocompletion.

Korn shell (Ksh): Combines the features of the Bourne shell and the C shell, supports scripting.

Z shell (zsh): An enhanced version of Bash with additional features such as autocompletion, themes, plugins.

1. Для чого потрібен менеджер пакетів. Які менеджери пакетів ви знаєте у Linux?

Purpose: A package manager allows you to install, update, remove, and manage software in Linux.

Examples:

APT (Advanced Package Tool): Used in Debian and Ubuntu.

YUM/DNF: Used in Red Hat, CentOS, Fedora.

Pacman: Used in Arch Linux.

Zypper: Used in openSUSE.

1. \*Які засоби безпеки використовуються в Linux?

SELinux (Security-Enhanced Linux): A mechanism for enforcing access control.

AppArmor: A mechanism for restricting application actions.

Firewall (iptables, nftables): For controlling network traffic.

SSH (Secure Shell): For secure remote access.

GPG (GNU Privacy Guard): For encrypting and signing data.

1. \*Чому використання віртуалізації зараз стало таким актуальним?

The use of virtualization has become relevant due to its numerous advantages in efficiency and resource savings.

Firstly, it allows you to run multiple virtual machines on a single physical server, which significantly reduces hardware costs.

Secondly, virtualization simplifies the management of IT infrastructure, making it easier to create, configure and migrate systems, and also increases the security and isolation of environments for development, testing and production tasks.

1. \*Як ви розумієте поняття контейнеризації?

Containerization is a technology that allows applications and their dependencies to be isolated in lightweight containers that run on a single operating system core. For example, Docker and Podman use containerization to deploy applications.

1. \*Які переваги/недоліки використання програмного забезпечення з відкритим кодом?

Advantages:

• Cheaper than commercial products

It is estimated that open source software saves business owners $60 billion each year. This is not surprising, considering that these programs are available to everyone. They are usually offered for free. Since this software is designed to be compatible with any computer, it allows users to extend the life of their equipment.

• High reliability

A common misconception is that open source software is prone to failure. On the contrary, it is very reliable because it is tested by many developers, testers and users.

• Flexibility

Since open source software does not lock you into a proprietary product, you are not limited to a specific IT architecture. Proprietary products usually require updates to both hardware and software. Thus, open source software allows users to mix and match their software to create a unique IT infrastructure that meets their needs.

Disadvantages:

• Vulnerability to malicious attacks

Some people who have access to the source code of open source software do not have good intentions. While most people use such access to find defects and improve the software, others look for ways to exploit vulnerabilities.

• Unlike commercial software, OSS may not be user-friendly

Not all open source software is user-friendly. It is created to meet the needs of developers to implement their ideas. As such, they do not pay much attention to the user interface, which makes it difficult to use for those without specialized knowledge.

• Lacks extensive customer support

Commercially produced software provides peace of mind to its users. After all, they know who designed, created, and distributed the software. That way, they know who is responsible if the software doesn't work or causes damage to the hardware.

1. \*\*Скільки активних віртуальних консолей (терміналів) може бути у процесі роботи Linux по замовчуванню. Як їх викликати та між ними перемикатися? Наведіть приклади?

By default, Linux has 6 virtual consoles

Ctrl + Alt + F1: Switch to tty1.

Ctrl + Alt + F2: Switch to tty2.

And so on up to Ctrl + Alt + F6.

Ctrl + Alt + F7: Return to the graphical shell

1. \*\*Яка віртуальна консоль (термінал) виконує функцію графічної оболонки?

The graphical shell usually starts on tty7

1. \*\*Чи можлива реєстрація в системі Linux декілька разів під одним і тим же системним ім’ям? Які переваги це може надати?

Yes, you can log in multiple times under the same name, if the system allows it.

A user can work in different sessions at the same time.

Useful for testing or working in different environments.

You can split workflows between sessions.

Висновки: During this work, we learned in practice how to use the graphical interface in Linux, how to use some console commands, learned a lot about the operating system itself. As well as about the capabilities of the Android mobile OS.

**Оформлення звіту:**

1. Титульний аркуш
2. Тема та мета роботи
3. Завдання попередньої підготовки
4. Основні позиції ходу роботи
5. Відповіді на контрольні запитання
6. Висновки за результатами роботи **(обов’язково!!!)**

**Система оцінювання лабораторної роботи:**

Виконано завдання базового рівня складності - **3 бали**

Виконано завдання базового та середнього рівня складності - **4 бали**

Виконано завдання всіх рівнів складності (в тому числі й підвищеного) - **5 балів**

Завдання середнього рівня складності позначені в завданнях (\*)

Завдання підвищеного рівня складності позначені в завданнях (\*\*)

**Примітка**: за виконання робіт в командах та оформлення звітів з використанням системи контролю версій (git) та англійської мови може бути нараховано **додатковий 1 бал**.