“Київський фаховий коледж зв’язку”

Циклова комісія комп’ютерної та програмної інженерії

**ЗВІТ ПО ВИКОНАННЮ**

**ЛАБОРАТОРНОЇ РОБОТИ №1**

з дисципліни: «Операційні системи»

**Тема: “Знайомство з робочим середовищем віртуальних машин та особливостями операційної системи Linux”**

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**Objective of the work:**

1. Familiarization with different types of hypervisors and virtualization when working with operating systems.
2. Introduction to the main types of modern operating systems, a brief overview of their features.

**Material support for classes:**

1. IBM PC-type computer.
2. Windows family operating system and VirtualBox virtual machine (Oracle).
3. GNU/Linux operating system (any distribution).
4. Cisco Networking Academy website (netacad.com) and its online Linux courses.

**Assignment for preliminary preparation**

**Preparation assignment** Prepared by student Krasavin V. (And below)

**Read the brief theoretical information for the lab work and create a small glossary of basic English terms related to the classification of operating systems.**

|  |  |
| --- | --- |
| Термін англійською | Термін українською |
| **Linux Has Distributions** | Linux-представлений у вигляді різних дистрибутивів |
| **Linux is a kernel** | Linux-це ядро |
| **Linux is Open Source** | Linux є відкритим програмним забезпеченням |
| **Linux Embraces the CLI** | Linux підтримує інтерфейс командного рядка (CLI) |

1. **After reading the material from the brief theoretical information, answer the following questions:**
   1. Describe the concept of a "hypervisor." What are its types?  
      A hypervisor is software or firmware that allows the creation and management of virtual machines (VMs) on a single physical server. The primary function of a hypervisor is to isolate the physical machine's resources (CPU, RAM, disk, network) and efficiently allocate them among multiple virtual machines, ensuring their independent operation.

**Type**: Bare Metal, Hosted.

* 1. **List the main components and features of hypervisors according to your variant**. (Xen).

**Main components:**

1. Domains
2. Гіпервізор Xen
3. Paravirtualization
4. Hardware-assisted Virtualization (HVM)
5. PVH (Paravirtualization Hardware)
6. Xenstore
7. XAPI (Xen API)

**Main features of the hypervisor Xen:**

1. High performance
2. Wide support for operating systems
3. Scalability
4. Security
5. Support for virtual machine migration (Live Migration)
6. Open source

Xen — It is a powerful and flexible type 1 hypervisor that provides effective hardware-level virtualization. Due to its support for various operating systems, scalability, security, and openness, Xen is widely used in both corporate environments and cloud computing.

**Procedure**

1. 1) Linux - Кращі дистрибутиви 2023 <https://youtu.be/PahmJBU9HKA?si=maxRf0nZlqs2hFGU>

2) ТОП 5 ПРИЧИН ЧОМУ АЙТІШНИКУ ВАРТО ПЕРЕЙТИ НА ЛІНУКС

       Доступ: <https://youtu.be/bP3_mZKezvM?si=sM3Mpc9JQ_0bY9Yd>

3) Як встановити Linux разом з Windows спосіб #1 Microsoft Store

       Доступ: <https://youtu.be/eEdGl6HvSdM?si=WDbwa71i034D2rQj>

4) Як встановити Linux разом з Windows спосіб #2 Dual Boot

       Доступ: <https://youtu.be/Hfky8TEyXss?si=ilduY167LS-vKl9y>

5) Як встановлювати програми на Linux. Linux українською #1

       Доступ: <https://youtu.be/M8XHJME6cxI?si=L0Koom59jTRnPXnU>

6) Як зробити панель завдань Linux як у Windows. Linux українською #2

       Доступ: <https://youtu.be/9szAz-A4gaM?si=LxaVueluI3tKRb1r>

7) Як встановити Ubuntu на VirtualBox <https://youtu.be/ADOaHm1VZII?si=hG5kDRsajFn7se8d>

8) The Shell (Linux) <https://drive.google.com/open?id=0B0PV0_SM0LoDSVNPWUVRdUxaN2s>

9) Linux Desktop Environments: XFCE vs GNOME vs KDE

Доступ: <https://youtu.be/2JBGQfPR5xQ?si=euswD7IHrODd-6JH>

**Answers to the review questions.**

**Prepared by student Rybalka B. (And below)**

**Type 1 hypervisors** (Bare-metal hypervisors)

**Features:**

1. Installed directly on the hardware, meaning the hardware operates without a base OS.
2. Have direct access to hardware resources.
3. Typically more efficient in terms of performance.
4. Require deeper knowledge for installation and configuration.

**Examples:**

* VMware ESXi
* Microsoft Hyper-V
* KVM (Kernel-based Virtual Machine)

**Applications:**

* Large enterprise data centers
* Cloud services
* High-load systems

**Type 2 hypervisors (Hosted hypervisors)**

**Features:**

* Installed as a regular application on top of an existing operating system.
* Have lower performance compared to Type 1 hypervisors due to the additional layer of abstraction.
* Easier to install and manage.
* Often used for educational purposes and small projects.

**Examples:**

* Oracle VirtualBox
* VMware Workstation

**Applications:**

* Software testing
* Application development
* Education
* Home use

1. The GNU General Public License (GNU GPL) is one of the most widely used licenses for free software, created by Richard Stallman for the GNU project. Its main goal is to provide users with the maximum freedom to use, study, modify, and distribute the software.

**Key concepts of GNU GPL:**

* **Freedom:** Users have the right to:
  + Use the program for any purpose.
  + Study how the program works and adapt it to their needs.
  + Distribute copies of the program to others.
  + Improve the program and distribute the changes.

**Copyleft:** This is a key principle of the GPL. It means that any modifications or derivative works created based on GPL-licensed software must also be licensed under the GPL. This ensures that the freedoms granted by the original software are preserved for all subsequent versions.

**Transparency:** The source code of GPL-licensed software is always available to everyone. This allows users to inspect the code, identify bugs, and make their own modifications.

3)

**Open-source software** is software whose source code is freely available to everyone. This means that anyone can view, modify, and distribute the code. The main advantages include: cost-free availability, high quality, flexibility, security, and longevity. Examples include: Linux, Android, Apache, MySQL.

4)

**Distribution** is a ready-made package of software, typically an operating system, that can be installed on a computer. It is like a box with all the necessary tools for operation.

**Examples**: Ubuntu, Fedora, Debian are distributions of Linux.

5)

**Main areas:**

* **Servers:** web, mail, databases, file servers, VPN.
* **Workstations:** for developers, designers, multimedia.
* **Specialized tasks:** data storage, cloud computing, IoT, scientific computing, security.

**Choosing a distribution:** depends on the task, the administrator's experience, the required software, and hardware.

6)

Android and Linux are closely related. The Linux kernel provides the foundation for Android, offering the core functions of the operating system. However, Android has its own graphical interface, libraries, and optimizations that make it specifically tailored for mobile devices.

7)

**Main features and applications of Embedded Linux:**

Embedded Linux is a tailored version of the Linux operating system designed specifically for devices with limited resources, such as microcontrollers, single-board computers, and other embedded systems. These systems are used in a wide range of devices, from smartphones and tablets to industrial controllers and household appliances.

**Main features of Embedded Linux:**

* **Small Size and Low Power Consumption:** Due to its modularity, Linux can be adapted to work on devices with limited memory and processing power.
* **Flexibility:** Can be customized to meet the specific requirements of a device, allowing for a variety of functions.
* **Open Source:** Provides access to the source code, enabling developers to modify and extend the system.
* **Support for a Wide Range of Hardware Platforms:** Numerous Embedded Linux distributions support various processor architectures.
* **Network Protocol Support:** Allows devices to connect to the Internet and interact with other devices.
* **Peripheral Device Support:** Can manage a variety of peripheral devices such as sensors, actuators, and displays.

**Applications of Embedded Linux:**

* **Consumer Electronics:** Smartphones, tablets, smartwatches, smart home devices.
* **Automotive Industry:** Engine management systems, onboard computers, infotainment systems.
* **Industrial Automation Systems:** Robots, CNC machines, manufacturing automation systems.
* **Medical Equipment:** Medical devices, patient monitoring systems.
* **Communication Systems:** Routers, switches, base stations.
* **Aerospace Industry:** Satellites, spacecraft.

8)

**To switch Linux boot mode from graphical to text (and vice versa), you need to:**

* **Edit the GRUB configuration file:** Locate the line with the kernel boot parameters and add/remove the parameter rd.initrd.resume=3.
* **Update GRUB:** Run the command sudo update-grub.

**Difference between CLI and GUI:**

* **CLI (Command-Line Interface):** A text-based interface where you need to know commands to operate.
* **GUI (Graphical User Interface):** A graphical interface that is more user-friendly for everyday users.

The choice of mode depends on the task: text mode is often used for administration and diagnostics, while graphical mode is used for regular work.

**Important:** Be cautious when editing the GRUB configuration, as incorrect changes can lead to boot issues.

**Conclusion:**

Linux is a flexible open-source operating system that allows customization to meet specific needs. It is used on both powerful servers and small devices. For example, Android uses the Linux kernel. You can choose between a text-based interface (for configuration) and a graphical interface (for everyday use).

**Key advantages of Linux:**

* **Flexibility:** Can be customized for any task.
* **Openness:** Source code is available.
* **Community:** Large number of users and developers.
* **Variety:** Many different distributions to suit various preferences.