“Київський фаховий коледж зв’язку”

Циклова комісія Комп’ютерної 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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**Мета роботи:**

1. Знайомство з гіпервізорами різного типу, віртуалізацією при роботі з операційними системами.
2. Знайомство з основними видами сучасних ОС, короткий огляд їх можливостей

**Матеріальне забезпечення занять** 1. ЕОМ типу IBM PC.

1. ОС сімейства Windows (Windows 7).
2. Віртуальна машина – Virtual Box (Oracle).
3. Операційна система GNU/Linux – CentOS.

# Завдання для попередньої підготовки

*Готував матеріал студент Нестолій Н.*

Прочитайте короткі теоретичні відомості до лабораторної роботи та зробіть невеличкий словник базових англійських термінів з питань класифікації ОС.

1. Прочитавши матеріал з коротких теоретичних відомостей дайте відповіді на наступні питання:

Operating System – операційна система

Hypervisors – гіпервізор

Virtual machine – віртуальна машина

Performance – продуктивність

Binary translation – двійкова трансляція

Interpreter – інтерпретатор

Application – програма

Interface - інтерфейс

Programming language – мова програмування

Code – код

Modularity – модульність

Software – програмне забезпечення

Development – розробка

2.1 **Охарактеризуйте поняття «гіпервізор». Які бувають їх типи?** A hypervisor, also known as a virtual machine monitor or VMM, is software that creates and runs virtual machines (VMs). A hypervisor allows one host computer to support multiple guest VMs by virtually sharing its resources, such as memory and processing. There are two main hypervisor types, referred to as “Type 1” (or “bare metal”) and “Type 2” (or “hosted”). A type 1 hypervisor acts like a lightweight operating system and runs directly on the host's hardware, while a type 2 hypervisor runs as a software layer on an operating system, like other computer programs.

2.2 **Перерахуйте основні компоненти та можливості гіпервізорів відповідно до свого варіанту. (12)**

**VMware:**

VMware Workstation Pro (known as VMware Workstation until release of VMware Workstation 12 in 2015) is a hosted hypervisor that runs on x64 versions of Windows and Linux operating systems (an x86-32 version of earlier releases was available); it enables users to set up virtual machines (VMs) on a single physical machine and use them simultaneously along with the host machine. Each virtual machine can execute its own operating system, including versions of Microsoft Windows, Linux, BSD, and MS-DOS. VMware Workstation is developed and sold by VMware, Inc.

Main VMware features:

* VMware Workstation supports bridging existing host network adapters and sharing physical disk drives and USB devices with a virtual machine. It can simulate disk drives; an ISO image file can be mounted as a virtual optical disc drive, and virtual hard disk drives are implemented as .vmdk files.
* VMware Workstation Pro can save the state of a virtual machine (a "snapshot") at any instant. These snapshots can later be restored, effectively returning the virtual machine to the saved state,[5] as it was and free from any post-snapshot damage to the VM.
* VMware Workstation includes the ability to group multiple virtual machines in an inventory folder. The machines in such a folder can then be powered on and powered off as a single object, useful for testing complex client-server environments.
* Run multiple virtual machines, containers or Kubernetes clusters on a single PC
* Ready for the latest releases of Windows 10 and major Linux distributions
* Enhanced 3D graphics support for DirectX 11 and up to 8GB of vGPU Memory
* Leverage VM Snapshots, Clones and virtual networking for maximum efficiency
* Move and access your virtual machines easily across VMware infrastructure
* Build, Push, Pull and Run OCI Container Images with the new vctl CLI
* Encrypt and build restricted or expiring Virtual Machines
* Run Workstation virtual machines and containers alongside WSL2 and Hyper-V on Windows
* Run a secure second desktop with different privacy settings, tools and networking configurations for online protection, or to take “snapshots” that can be restored later.
* Multi-language keyboard support
* Supports wide range of virtual devices
* Host/guest file sharing
* Create large Virtual machines (16CPU, 64GB RAM, 3GB vRAM)
* 4K display support
* USB smart card reader support

**Хід роботи**

*Готувала матеріал студентка Усенко С.*

1. **Перерахуйте етапи для розгортання операційної системи на базі віртуальної машини VirtualBox.**
2. Open Oracle VM Virtual Box, in the toolbar, click the New button. The New Virtual Machine Wizard is displayed in a new window.
3. Click the Next button to move though the various steps of the wizard. The wizard enables you to configure the basic details of the virtual machine. On the VM Name and OS Type step, enter a descriptive name for the virtual machine in the Name field and select the operating system and version that you are going to install from the drop-down lists. It is important to select the correct operating system and version as this determines the default settings for VirtualBox uses for the virtual machine. You can change the settings later after you have created the virtual machine.
4. On the Memory step, you can simply accept the default. This is the amount of host memory (RAM) that VirtualBox assigns to the virtual machine when it runs. You can change the settings of the virtual machine later, when you import the template into Oracle VDI.
5. On the Virtual Hard Disk step, ensure Start-up Disk is selected, select Create new hard disk and click Next. The Virtual Disk Creation Wizard is displayed in a new window so you can create the new virtual disk.
6. On the following steps, select VDI (VirtualBox Disk Image) as the file type, Dynamically allocated as the storage details, and accept the defaults for the virtual disk file location and size, and then click Create to create the virtual disk.
7. When the virtual disk is created, the Virtual Disk Creation Wizard is closed and you are returned to the Summary step of the New Virtual Machine Wizard. Click Create to create the virtual machine. The wizard is closed and the newly-created virtual machine is listed in Oracle VM VirtualBox Manager.
8. Since you want to install an operating system in the virtual machine, you need to make sure the virtual machine can access the installation media. To do this, you edit the virtual machine settings. In Oracle VM VirtualBox Manager, select the virtual machine and then in the toolbar click the Settings button. The Settings window is displayed. In the navigation on the left, select Storage.
9. In the Storage Tree section, select Empty below the IDE Controller. The CD/DVD Drive attributes are displayed. Click the CD/DVD icon next to the CD/DVD Drive drop-down list and select the location of the installation media, as follows:

To connect the virtual CD/DVD drive to the host's physical CD/DVD drive, select Host Drive <drive name>.

To insert an ISO image in the virtual CD/DVD drive, select Choose a virtual CD/DVD disk file and browse for the ISO image.

1. Click OK to apply the storage settings. The Settings window is closed. If you connected the virtual machine's CD/DVD drive to the host's physical CD/DVD drive, insert the installation media in the host's CD/DVD drive now. You are now ready to start the virtual machine and install the operating system.
2. In Oracle VM VirtualBox Manager, select the virtual machine and click the Start button in the toolbar. A new window is displayed, which shows the virtual machine booting up. Depending on the operating system and the configuration of the virtual machine, VirtualBox might display some warnings first. It is safe to ignore these warnings. The virtual machine should boot from the installation media.
3. ou can now perform all your normal steps for installing the operating system. Be sure to make a note of the user name and password of the administrator user account you create in the virtual machine, which you will need in order to log in to the virtual machine. Do not join the virtual machine to a Windows domain (it can be a member of a workgroup) as the domain configuration is performed later. The virtual machine might reboot several times during the installation. When the installation is complete, you might also want to let Windows Update to install any updates.
4. **Чи є якісь апаратні обмеження при встановленні 32- та 64-бітних ОС?**

Installing a 64-bit version of operating system requires a CPU that supports 64-bit versions of Windows.

1. **Які основні етапи при встановленні CentOS в текстовому режимі?**

***Installing CentOS***

* Setting the date and time - at this stage, it is enough to select your time zone, and the time will be set automatically.
* Installation source - at this stage, you can not change anything, then the files for installation will be taken from the media with the system.
* Language and layout settings - you must select one primary system language and one additional language, as well as specify the required keyboard layouts for them.
* Software to install - at this stage, you need to select the minimum software package, since we need to deploy a server without a desktop and a graphical interface.
* Installation location - at this stage, select the hard drive on which the installation will be performed, as well as the markup.
* Internet settings - here you need to enter data about connecting to the Network.

1. **Яким чином можна до установити графічні оболонки Gnome та KDE на CentOS, якщо вона вже встановлена в текстовому режимі ?**

1) Log in to the CentOS console and enter the command-line shell. Then, execute the following dnf command:

*dnf group list*

2) Use the dnf command to install the Workstation group:

*dnf groupinstall workstation*

This might take some time. Press y to continue with the installation.

3) Once the GNOME desktop installation is completed, change the default boot to the graphical run level. This will ensure that the next time you reboot the system, the system will boot to GUI which in this case is GNOME

*systemctl set-default graphical.target*

4) Start graphical desktop session

*systemctl isolate graphical.target*

You can alternatively reboot your system if possible.

1. **Дайте коротку характеристику графічних інтерфейсів, що використовуються в різних дистрибутивах Linux відповідно до свого варіанту (17).**

**Gnome:**

Unique, user-friendly interface with dynamic workspaces and intuitive settings app. Has different extensions which can be downloaded. Highly customizable, productivity focused UI.

**JWM:**

Very lightweight window manager, written on C. Fully customizable using xml files. Closely resembles windows, easy to use. Main downside of JWM is that it doesn't have as many plugins and minor features as Gnome and KDE.

# Відповіді на контрольні запитання:

*Готував матеріал студент Титов О.*

**1.Порівняйте гіпервізори типу 1 та типу 2, яка між ними відмінність та сфера їх застосування?**

Standalone hypervisor (Type 1)

A standalone hypervisor is loaded by a bootloader or firmware, and runs configured operating systems in individual virtual machines. Some standalone hypervisors have their own device drivers and scheduler.

Based on Base OS (Type 2)

This is a component that works in the same ring as the core of the main OS ("ring 0", according to the terminology of the x86 architecture). Guest code may execute directly on the physical processor, but access to the computer's I/O devices from the guest OS is through a second component, a normal host OS process—the user-level monitor.

In practice, the real distinction between a type 1 hypervisor and a type 2 hyper- visor is that a type 2 makes uses of a host operating system and its file system to create processes, store files, and so on. A type 1 hypervisor has no underlying support and must perform all these functions itself. For enterprise applications and cloud computing, the Type-1 hypervisors are preferable, primarily because of its independence from the host operating system. Type-2 hypervisors are more suitable for personal use, as they are easier to deploy and work with.

**2.Розкрийте поняття «GNU GPL», яка його основна концепція?**

The GNU General Public License (GNU General Public License or GNU General Public License) is one of the most popular free software licenses created by Richard Stallman for the GNU project.

The purpose of the GNU GPL is to give a user the right to copy, modify, and distribute a program and an obligation that users of all programs derived from it will also receive those rights. The principle of "inheritance" of such rights is called, such a term was proposed by Richard Stallman. Unlike the GPL, licenses for proprietary software very rarely grant the user such rights and, mostly, try to limit them, for example, by establishing a ban on restoring the source code.

**3.В чому суть програмного забезпечення з відкритим кодом?**

Open source software is cheaper, more flexible and has more longevity than its proprietary peers because it is developed by communities rather than a single author or company. Open source licenses affect the way people can use, study, modify, and distribute software. In general, open source licenses grant computer users permission to use open source software for any purpose they wish. Releasing work as open source and the corresponding contribution process eventually result in a higher return on the initial investment made versus the alternative closed source process.

**4.Що таке дистрибутив?**

kernel, tools, and suite of applications that come bundled together in what is referred to as a distribution.

**5.Які задачі системного адміністрування можна реалізувати на базі ОС Linux?**

The main tasks of a system administrator (superuser) in Linux include:

* installation (installation) of the OS;
* management of the OS loading process;
* setting operating modes of the OS;
* editing configuration files;
* mounting and dismounting of file systems;
* introduction and removal of OS users;
* software updates;
* OS kernel configuration;
* ensuring the reliable functioning of the OS;
* computer network configuration.

**6.Як пов’язані між собою ОС Android та Linux?**

Android as a framework is definitely created as an extension of the Linux kernel. The developers of Android didn’t have to write the code from scratch; they had the necessary work laid out for them in the form of Linux or as a “pre-built. “. Android doesn’t fully utilize the Linux Kernel, only a few parts that it finds relevant, so it’s not “Linux” in the sense that it’s a Linux distro.

**7.Основні можливості та сфера використання Embedded Linux?**

An embedded system is a set of computer hardware and software based on a microcontroller or microprocessor, controlled by a real-time operating system or RTOS, limited memory, and that can vary both in size and complexity. Embedded Linux is a type of Linux operating system/kernel that was designed to be installed and used in embedded devices or systems. It gets used in cars software, and many other examples such as network equipment, machine control, industrial automation, navigation equipment, spacecraft flight software, and medical instruments in general.

**8.Яким чином можна змінити типу завантаження Linux: в текстовому режимі (3 рівень) або графічному**

**(рівень 5)? Чим відрізняються режими CLI та GUI?**

CLI is an abbreviation used for Command Line Interface, which are common interfaces widely used in the 1980s. A command line interface (CLI) allows users to write commands in a terminal or console window to communicate with the operating system. It is an environment where users respond to a visual prompt by writing a command and receiving a response from the system. Users must enter a command or command to perform a task. CLIs are more precise than GUIs, but require mastery of commands and syntax. It emphasizes the cognitive process as the primary task. CLI is suitable for expensive computing where input accuracy is a priority.

GUI extends to graphical user interface. A GUI uses graphics to allow users to interact with an operating system or program. The GUI provides windows, scroll bars, buttons, wizards, icon images, other icons to facilitate the users. It's an easy-to-use interface for beginners. It is intuitive, easy to learn and reduces cognitive load. Unlike the CLI, GUI users do not need to memorize commands, but require recognition and good research analysis and graphics.

GUI lets a user interact with the device/system with the help of graphical elements, like windows, menus, icons, etc. The CLI, on the other hand, lets a user interact with their device/system with the help of various commands.

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**Висновок:**

Під час виконання лабораторної роботи ми ознайомились з гіпервізорами різного типу, віртуалізацією при роботі з операційними системами, а також отримали знання про основні види сучасних ОС і коротко оглянули їх можливості.