“Київський фаховий коледж зв’язку”

Циклова комісія Комп’ютерної інженерії

**ЗВІТ ПО ВИКОНАННЮ**

**ЛАБОРАТОРНОЇ РОБОТИ №1**

з дисципліни: «Операційні системи»

**Тема:** "Introduction to the Work Environment of Virtual Machines and Operating Systems of Various Families."

Виконав(ла/ли) студент(ка/и)

групи КСМ - 13А

Команда BBC: Петрик С.С.,

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Перевірив викладач

Сушанова В.С.

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**Мета роботи:**

1. Отримання практичних навиків роботи з середовищами віртуальних машин та операційними системами різних типів та сімейств – 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 (Windows 11).

3. Віртуальна машина – Virtual Box (Oracle).

4. Операційна система GNU/Linux – CentOS.

**Завдання для попередньої підготовки**

***Готував матеріал студент Петрик С.***

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

|  |  |
| --- | --- |
| Термін англійською | Термін українською |
| **Operating System** | Операційна система |
| **Protection** | Захист |
| **Virtual Machine** | Віртуальна машина |
| **Hypervisor** | Гіпервізор |
| **Commit** | Комміт |
| **Repository** | Репозиторій |
| **File** | Файл |
| **Software** | Програмне забезпечення |
| **Kernel** | Ядро |
| **Program** | Програма |
| **Desktop** | Робочий стіл |
| **Community** | Спільнота |
| **Hardware** | Обладнання |

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

***Готував матеріал студент Петрик С.***

* 1. Охарактеризуйте поняття «гіпервізор». Які бувають їх типи?

The term "hypervisor" refers to software or hardware that manages virtualization of computer resources. A hypervisor allows multiple virtual machines (VMs) to run on a single physical host system, sharing its underlying hardware resources.

There are two main types of hypervisors:

* **Type 1 Hypervisor (Bare-Metal Hypervisor):**

This type of hypervisor runs directly on the physical hardware of the host system, without requiring an underlying operating system.

It provides a higher level of performance and security since it eliminates the need for an additional OS layer.

Examples of Type 1 hypervisors include VMware vSphere/ESXi, Microsoft Hyper-V (when used in standalone mode), and Xen.

* **Type 2 Hypervisor (Hosted Hypervisor):**

Type 2 hypervisors run on top of an existing operating system, known as the host OS.

They are generally used for development, testing, or scenarios where performance is not critical.

Examples of Type 2 hypervisors include Oracle VirtualBox, VMware Workstation, and Parallels Desktop.

Both types of hypervisors have their own advantages and use cases. Type 1 hypervisors are typically preferred for production environments where performance and security are paramount, while Type 2 hypervisors are more suitable for desktop or testing environments.

**Хід роботи**

***Готував матеріал студент Панчук О.***

Робота в графічному режимі в ОС сімейства Linux:.

1. Запустіть віртуальну машину VirtualBox, ознайомтесь з її основними можливостями, прочитайте довідку по роботі з нею.

2.1. Steps for deploying an operating system on a VirtualBox virtual machine typically include:

a. Installing VirtualBox on your computer.

b. Downloading the operating system image you want to install.

c. Creating a new virtual machine in VirtualBox and configuring its settings, such as the amount of virtual memory, the size of the virtual hard disk, etc.

d. Setting the operating system image as the bootable disk for the virtual machine.

e. Booting the virtual machine and going through the OS installation process as if it were on a physical computer.

f. Configuring the OS after installation, including network settings, users, and passwords.

g. Installing VirtualBox Guest Additions to optimize interaction between the guest and host systems.

h. Completing system setup and configuration within the virtual machine.

2.2. Yes, there are hardware limitations when installing 32-bit and 64-bit OS. 32-bit operating systems are limited to utilizing up to 4 gigabytes of RAM (Random Access Memory), while 64-bit operating systems can support significantly more RAM, typically 16 gigabytes or more. Additionally, 64-bit operating systems are better equipped to take advantage of multi-core processors and motherboards.

2.3. The main steps when installing CentOS in text mode may include:

a. Booting from the CentOS installation media.

b. Choosing the installation language and local timezone.

c. Configuring the network settings, including entering the IP address, subnet mask, gateway, and DNS.

d. Selecting the disk partition where CentOS will be installed and configuring partitions.

e. Setting the root password and creating user accounts.

f. Selecting the packages and components you want to install.

g. Initiating the installation process.

h.Completing the installation and rebooting the system.

2.4. To install the Gnome and KDE graphical desktop environments on CentOS if it's already installed in text mode, you can use the following commands and packages:

For Gnome:

sudo yum groupinstall "Server with GUI"

For KDE:

sudo yum groupinstall "KDE Plasma Workspaces"

After running these commands, the system will install the necessary packages for the graphical interface. Once the installation is complete, you can reboot the system or use the command: startx to start the graphical interface.

2.5. Gnome (GNOME):

* Interface Type: Gnome is one of the most popular graphical interfaces for Linux and is used in many distributions.
* Appearance and Design: Gnome has a modern and minimalist design. It employs a smooth interface with large icons, panels, and menus. Gnome also supports a wide range of themes and extensions for customizing its appearance.
* Functionality: Gnome provides various features, including a multitude of built in applications, flexible settings, and the ability to extend functionality through extensions.
* Resource Usage: Gnome may demand more resources (RAM and computational power) compared to some other interfaces, making it less suitable for older or lightweight systems.

JWM (Joe's Window Manager):

* Interface Type: JWM is a less common graphical interface and is primarily used on lightweight or embedded Linux systems.
* Appearance and Design: JWM features an extremely lightweight and minimalist design. It is known for its speed and simplicity. Menus and panels in JWM can be customized, but by default, they are quite limited.
* Functionality: JWM offers a basic set of window management, menu, and configuration functions. It is designed for users seeking a lightweight and fast interface without unnecessary features.
* Resource Usage: One of the main advantages of JWM is its low resource requirements. It performs well on older or low performance systems and consumes minimal RAM and CPU power.

When choosing between Gnome and JWM, users should consider their needs and their system's hardware capabilities. Gnome provides more functionality and visual customization but demands more resources, whereas JWM is a choice for those seeking a lightweight and speedy interface.

Xen hypervisor:  
Here are the main components and capabilities of the Xen hypervisor:

**Components:**

1. **Hypervisor (Xen):** The core component that provides virtualization capabilities, allowing multiple guest operating systems to run on a single physical machine.
2. **Domain 0 (Dom0):** Also known as the control domain, it runs a privileged guest operating system (usually Linux) and has special access to the hypervisor. Dom0 manages other domains and serves as the administrative interface to the Xen system.
3. **Domain U (DomU):** These are unprivileged guest domains that run regular operating systems. DomUs are isolated from each other and from Dom0, providing a secure environment for running applications.
4. **XenStore:** A shared storage area that facilitates communication between Dom0 and DomU instances. It's used for configuration, event notification, and other inter-domain communication.
5. **XenBus:** A communication mechanism that allows guest domains to discover and communicate with various virtual devices provided by the hypervisor.

**Capabilities:**

1. **Paravirtualization:** Xen can run both fully virtualized and paravirtualized guests. Paravirtualization involves modifying the guest operating system to be aware of the virtualization layer, resulting in improved performance and efficiency.
2. **Hardware Virtualization (HVM):** Xen supports hardware virtualization extensions like Intel VT-x and AMD-V, enabling the virtualization of unmodified guest operating systems, such as Windows, without requiring modification (though it also supports paravirtualized guests).
3. **Resource Management:** Xen provides robust resource management features, allowing administrators to allocate CPU, memory, and other resources to guest domains according to their needs.
4. **Live Migration:** Xen supports live migration, which allows a running virtual machine to be moved from one physical host to another with minimal downtime. This is valuable for load balancing and system maintenance.
5. **Security Isolation:** Xen provides strong isolation between guest domains, making it difficult for a compromised guest to affect other domains or the hypervisor itself. This enhances system security.
6. **Performance Optimization:** Xen offers performance optimizations such as CPU pinning, allowing specific virtual CPUs to be assigned to physical CPU cores for better performance.
7. **Snapshotting:** Xen supports snapshotting, allowing administrators to capture the current state of a virtual machine and revert to that state if needed.
8. **Multi-tenancy:** Xen is suitable for creating multi-tenant environments, where multiple users or organizations can share a single physical server while maintaining isolation and security.

These are some of the core components and capabilities of the Xen hypervisor, making it a versatile choice for virtualization in various environments.

**Відповіді на контрольні запитання**

***Готував матеріал студент Панчук О.С.***

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

GNU GPL розшифровується як "General Public License" is one of the most important and widely used licenses for free and open-source software (FOSS), його основна суть It is the creation of free software that allows users to use, modify, distribute, and collaborate on its development freely.  
The main principles and concepts of GNU GPL include the following:

1. Freedom of use: The license allows anyone to use the software, including commercial use, without restrictions.
2. Freedom to modify: GNU GPL allows users to change and adapt the software as they see fit. This promotes development and improvement of the software.
3. Freedom to distribute: Anyone who receives the software has the right to distribute it to other users, whether for free or for a fee. GNU GPL ensures the preservation of these freedoms for all recipients.
4. Open source code: Software distributed under the GNU GPL license has open source code. This means that everyone who uses the program has access to its source code and can inspect how it works.
5. Preservation of freedoms: One of the key ideas of GNU GPL is to ensure that users' freedoms are preserved and even expanded when the software is modified or distributed. This is achieved through the requirements of the license, which must be distributed along with the software.

***Готував матеріал судент Panchuk O.C***

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

Type 1 and Type 2 hypervisors primarily differ in where they operate and their characteristics:

Type 1 hypervisor (e.g., VMware ESXi, Microsoft Hyper-V) operates directly on the hardware level and doesn't require a host operating system for guest virtual machines (VMs). It provides better performance and isolation and is often used in data centers.

Type 2 hypervisor (e.g., VirtualBox, VMware Workstation) runs on top of a host operating system and utilizes its resources. It's usually less performant but convenient for development and testing.

1. В чому суть програмного забезпечення з відкритим кодом?

Open-source software is software whose source code is available for viewing, modification, and distribution under a publicly accessible license. The main idea is that anyone can contribute to the software's development, leading to a wealth of shared efforts and innovations.

1. Що таке дистрибутив?

A distribution (distro) is a ready-made package of the Linux operating system, including the Linux kernel, system utilities, a desktop environment or command-line interface, other software, and configurations. Examples of distributions include Ubuntu, Fedora, CentOS.

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

Linux system administration tasks include managing users and groups, configuring networking,

I nstalling and updating software, ensuring security, monitoring and debuggin the system, data backup and recovery, and many other administrative tasks.

1. Як пов'язані між собою ОС Android та Linux?  
   Android OS is based on the Linux kernel and uses many components from the Linux world. Android is a specialized OS developed for mobile devices and has its own application runtime and user interface, different from traditional Linux.
2. Основні можливості та сфера використання Embedded Linux?

Embedded Linux refers to the use of Linux on embedded systems such as routers, TVs, automotive electronic systems, and more. Key features include low resource requirements, convenient support for various hardware devices, and extensive configurability for specific needs.

1. Яким чином можна змінити типу завантаження Linux: в текстовому режимі (3 рівень) або графічному (рівень 5)? Чим відрізняються режими CLI та GUI?

To change the boot type of Linux to text mode (level 3) or graphical (level 5), you can edit the Grub configuration file (/etc/default/grub) and change the value of "GRUB\_CMDLINE\_LINUX" to "3" or "5". Then, update the Grub configuration with the command "sudo update-grub". Command Line Interface (CLI) mode is a text-based interface without a graphical environment, whereas the Graphical User Interface (GUI) provides a visual interface for users with windows, buttons, and other graphical elements for easier interaction.

**Висновки**

В ході виконання лабораторної роботи мною було досліджено віртуальну машину VirtualBox, більш детально теоретично досліджено питання поняття гіпервізорів та їх різновиди. Отримано практичні навики роботи в команді.