“Kyiv specialized College of Communications”

Commission of computer engineering

**REPORT ON THE IMPLEMENTATION**

**LABORATORY WORK №1**

From the discipline: "Operating systems"

**Topic: "Introduction to the virtual machine environment and features of the Linux operating system"**

The students

performed Groups RPZ-03

Team 3:

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**Objectives:**

1. Familiarity with hypervisors of various types, virtualization when working with operating systems.

2. Familiarity with the main types of modern operating systems, a brief overview of their capabilities.

**Material support of classes**

1. IBM PC type computer.

2. OS of the Windows family (Windows 7).

3. Virtual machine - Virtual Box (Oracle).

4. GNU/Linux operating system - CentOS.

5. Cisco Network Academy website netacad.com and its online courses on Linux

***The material was prepared by student Кryvenko Andrew (AndrewKryvenko)***

**1.Read the brief theoretical information for the lab and make a small glossary of basic English terms on the classification of virtual environments.**

high-end enterprise servers – сервери високого класу

separate computers – окремі комп’ютери

dedicated hosting – виділений хостинг

kernel module – модуль ядра

distinction – відмінність

GUI – графічний інтерфейс

Shipped – відправлено

Definition – визначення

uniquely portable – унікально портативна

fledgling operating system – молода операційна система

***The material was prepared by student Кryvenko Andrew (AndrewKryvenko)***

**2. After reading the brief theoretical information, answer the following questions:**

**2.1 Describe the concept of "hypervisor". What are their types?**

A hypervisor is a software layer that allows the creation and management of virtual environments on a computer. It acts as an intermediary between the physical hardware of a computer and the virtual environments (also known as virtual machines) that run on top of it. The hypervisor provides a secure and isolated environment for each virtual machine, ensuring that they cannot interfere with each other or access the underlying physical hardware directly.

There are two types of hypervisors:

Type 1 Hypervisor: Also known as a bare-metal hypervisor, this type of hypervisor runs directly on the host's physical hardware, without the need for a host operating system. It provides full control and isolation between the physical hardware and the virtual machines, making it ideal for use in security-sensitive environments such as datacenters and cloud computing.

Type 2 Hypervisor: This type of hypervisor runs as an application on top of a host operating system. It provides a less secure and isolated environment compared to a type 1 hypervisor, but is simpler and easier to use, making it ideal for desktop virtualization and testing purposes.

**2.2 List the main components and capabilities of hypervisors according to your variant (serial number in the log), Table 1.**

Xen is a hypervisor that provides virtualization for x86 and ARM architectures. Here are some of its main components and features:

Xen Core: This is the core component of the Xen hypervisor, responsible for virtualizing the physical resources of the host and creating virtual machines.

Virtual Machine Monitor (VMM): The VMM is responsible for creating and managing virtual machines, controlling their access to physical resources, and managing the communication between VMs and the physical network.

Virtual Devices: Xen provides virtualized versions of physical devices, such as network interfaces and storage devices, that can be assigned to virtual machines.

Paravirtualization: Xen uses paravirtualization, which requires the guest operating systems to be modified to run in a virtual environment, resulting in higher performance and security compared to full virtualization.

Resource Management: Xen provides tools and mechanisms for resource management and allocation, such as CPU scheduling, memory management, and network resource control.

Live Migration: Xen supports live migration, which enables virtual machines to be moved from one host to another while they are running, without any disruption to the users or applications.

Security: Xen provides security features, such as isolation between virtual machines, control over resource allocation, and support for virtualization-aware security solutions.

***The material was prepared by student Kanavets Kateryna (@kanavetsk)***

**2. After watching the video, answer the following questions.**

**2.1. List the steps to deploy an operating system based on a VirtualBox virtual machine.**

- Downloading an operating system distribution

- Create a virtual machine

- Setting up resources

- Install the operating system

- Configure virtual machine settings

- Update the necessary drivers and programs

- Perform testing

**2.2. Are there any hardware limitations when installing 32-bit and 64-bit operating systems?**

A 32-bit operating system requires a minimum of 1 GB of RAM, and a 64-bit operating system requires a minimum of 2 GB. A minimum of 15 GB of free hard disk space is also required.

**2.3 What are the main steps in installing CentOS in text mode?**

The main stages:

- Connection for the hypervisor

-Create a new virtual machine

-Allocate an ISO file

-Choose how you want to boot CentOS

-Set the text parameter

-Fill in the locale, language, and input rules.

-Select the type of configuration to place on the hard disk.

-Install and configure system settings.

-Set up network connections.

-Install and configure additional programs.

-Complete the installation and start working with the system.

**2.4. How can I install the Gnome and KDE desktops on CentOS if it is already**

installed in text mode (specify the necessary commands and packages)?

To install the Gnome and KDE desktops on CentOS, you must use the yum command. The following command will install the Gnome desktop on CentOS:

yum groupinstall "Gnome Desktop"

To install the KDE desktop on CentOS, use the following command:

yum groupinstall "KDE Desktop"

You can also use the yum install command to download the necessary packages. For example, to install the gnome-terminal package, use the following command:

yum install gnome-terminal

**2.5. Give a brief description of the graphical interfaces used in different**

Linux distributions according to their version (serial number in the log), Table 2.

Xfce and Fvwm

Xfce offers fast and smooth solutions, unlike other Linux interfaces that try to burden system memory with animations. It is a lightweight desktop environment based on GTK and shadowed by GNOME. There are fewer developers working on Xfce, so there are fewer programs created with this interface in mind.

FVWM is a window manager for the X Window System that supports virtual screens whose resolution can exceed the resolution of the user's display or GPU. Being a derivative of twm, the manager has evolved into a powerful graphical environment for UNIX systems with extensive customization options.

**2.6.Read the brief theoretical information for the lab and make a small glossary of basic English terms on the classification of virtual environments.**

1. GNU/Linux is an operating system: a collection of programs that allow you to work with your computer and run other programs.

2. A GNU/Linux distribution is a general definition of operating systems that use the Linux kernel and are ready for final installation on user hardware.

3. Kernel Space is the memory space where the kernel code is stored and executed.

4. User Space is the address space where ordinary user processes are executed.

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

6. CentOS is a freely available Linux distribution on the basis of which the commercial distribution of Red Hat Enterprise Linux by Red Hat is formed.

7. Virtual machine - a model of a computer created by virtualizing computing resources: processor, RAM, storage devices, and input and output.

***The material was prepared by student Kulikovska Maria (@Smith5004)***

**Checklist questions**

**1. Compare type 1 and type 2 hypervisors, what is the difference between them and their scope of application?**

A type 1 hypervisor runs directly on the physical hardware of the host computer. A type 1 hypervisor does not need to load the underlying OS, it runs directly on the physical hardware. Virtualization reduces the risk of attacks targeting security flaws and vulnerabilities in operating systems, as each guest has its own OS. Type 1 hypervisors are considered the most efficient and productive hypervisors available for enterprise computing.

A type 2 hypervisor is usually installed on top of an existing OS. Type 2 hypervisors are not used for data center computing and are reserved for client or end-user systems where performance and security are less important. Software developers can use a type 2 hypervisor to create virtual machines to test a software product before it is released. IT organizations typically use Type 2 hypervisors to create virtual desktops. Type 2 hypervisors can support large and complex nested environments.

**2. Explain the concept of "GNU GPL", what is its main concept?**

GNU General Public License is a license for free software. It allows and guarantees the user's right to freely use, distribute, and modify the software, unlike a commercial license that prohibits the distribution and modification of software.

**3. What is the essence of open source software?**

Open source software is software that is openly available. These licenses assume that anyone can access the source code of the program, use and transform it for specific tasks without violating the rights of the developer.

**4. What is a distribution kit?**

An operating system distribution is a way of distributing system software. Distributions contain programs for initializing the system, an installer, and several special packages containing specific parts of the system. Distributions are needed to combine the form of software distribution with the form of software on the actual device.

**5. What system administration tasks can be implemented on the basis of Linux?**

System administration tasks based on Linux:

-Support all Internet requests, including DNS, RADIUS, Apache, MySQL, PHP.

- Regular backup of data, creation of new stored procedures and compilation of a backup list.

- Analyzing all error logs and fixing them, as well as providing support to web hosting customers, ISPs, and LAN customers during the resolution of elevated support issues.

- Identify and resolve service issues, ranging from disaster recovery to login issues.

- Installing the necessary systems and security features.

- Troubleshooting when a problem occurs on the server.

**6. How are Android and Linux related?**

Linux is a set of free and open source Unix-like operating systems. The kernel used in Linux is a monolithic kernel.

Android is a mobile operating system based on a modified version of the Linux kernel and other open source software.

**7. What are the main features and applications of Embedded Linux?**

Embedded Linux is a type of Linux operating system/kernel that was developed for installation and use in embedded devices or systems. It allows a modular approach to building a user system, which provides greater flexibility.

Although it uses the same kernel, embedded Linux is very different from the standard operating system. First, it is focused on embedded systems, so it is much smaller, requires less processing power, and has a minimal set of features. The Linux kernel is modified and optimized as an embedded version of Linux. Such an instance of Linux can run only applications created specifically for this device.

**8. How can I change the type of Linux boot: in text mode (level 3) or graphical mode (level 5)? What is the difference between CLI and GUI modes?**

To change the Linux startup level from 3 to 5, you need to change the /etc/inittab file:

1) Log in as root

2) Open the /etc/inittab file using the vi text editor or the gedit GUI text editor(# vi /etc/inittab).

Or:

Open a terminal command prompt and enter the command: # gedit /etc/inittab.

3) Find the default startup level named initdefault.

The initdefault entry indicates the startup level that should be entered after the system boots. If it does not exist, init will prompt for the run level on the console.

4) Replace run level 3 with 5:

From: id:3:initdefault:

To: id:5:initdefault:

5) Save the changes.

6) Reboot Linux for the changes to take effect. The next time Linux boots, it will be in a graphical user interface

GUI stands for graphical user interface. It takes advantage of computer graphics. It allows the user to interact with the computer using components such as windows, icons, labels, text boxes, and switches. It is easy for a user to perform tasks using a graphical user interface because it does not require memorizing commands.

CLI stands for command line interface. It is also referred to as a command language interpreter, console user interface, or character-based user interface. It allows users to type commands into a terminal to perform a task.

**9.Read the brief theoretical information for the lab and make a small glossary of basic English terms on the classification of virtual environments.**

Raw disk partition - початковий розділ диска

Precise control - точний контроль

User-facing applications - орієнтовані на користувача додатки

To accomplish - досягти

Capability - здатність

Traced back - простежується

CLI - інтерфейс командного рядка

Closed-source license - ліцензія із закритим вихідним кодом

Greatly accelerating - значно прискорюється

Ensuring mistakes - запобігання помилкам