“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.

2. ОС сімейства Windows (Windows 7).

3. Віртуальна машина – Virtual Box (Oracle).

4. Операційна система GNU/Linux – CentOS.

5. Сайт мережевої академії Cisco netacad.com та його онлайн курси по Linux

**Завдання для попередньої підготовки**

*Готував матеріал студент: Желевський В.*

**1. Read the short theoretical information for the laboratory work and make a small dictionary basic English terms on classification of virtual environments.**

* shared hosting
* binary translation
* machine simulators
* binary translation
* privileged instruction
* host operating system
* guest operating system
* command line interface

**2. After reading the material from short theoretical information, answer the following questions:**

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

A hypervisor is a program that manages the physical resources of a computer and distributes those resources among several different operating systems, allowing them to run simultaneously. A hypervisor provides mutual isolation of operating systems running on virtual machines by separating physical and logical devices between multiple virtual machines.

Types of hypervisors:

* type 1 hypervisor;
* pure type 2 hypervisor;
* practical type 2 hypervisor;

2.2. List the main components and capabilities of hypervisors according to your option (serial number according to the journal), Table 1.

**VMware**

Main components:

* [*ESX/ESXi*](https://uk.wikipedia.org/w/index.php?title=VMware_ESX&action=edit&redlink=1) — a virtualization tool that abstracts the resources of physical servers, such as: processor, memory, hard drives and others, in order to create virtual machines.
* *vCenter Server* — a tool for configuration, resource allocation and platform management.
* *vSphere Client* —  an interface that allows users to remotely connect to vCenter Server or directly to ESX/ESXi from computers running Windows.
* *Web Access* — a web interface that provides the ability to manage virtual machines and provides access to remote consoles.
* [*VMFS*](https://uk.wikipedia.org/w/index.php?title=VMFS&action=edit&redlink=1) — virtual machine file system (Virtual Machine File System), high-performance cluster file system of ESX/ESXi servers (hosts).
* *Virtual*[*SMP*](https://uk.wikipedia.org/wiki/SMP) — virtual symmetric multiprocessing (Symmetric Multiprocessing), a function that allows one virtual machine to use several physical processors at the same time.
* *VMotion* — a function that ensures the transfer of a virtual machine from one physical server to another without stopping its operation.
* *Storage VMotion* — a function that ensures the transfer of virtual machine files in the middle of a physical disk array, or even from one disk array to another, without losing access to these files.
* [*HA*](https://uk.wikipedia.org/w/index.php?title=HA&action=edit&redlink=1)— high availability (High Availability), a means of ensuring system redundancy. With regard to vSphere, this means that in case of failure of a physical server, virtual machines placed on it will automatically resume their work on another server if there are enough physical resources on it.
* *Fault tolerance* — fault tolerance, a function that allows you to have a full copy of a virtual machine on another physical server online, that is, any changes to a specific virtual machine are instantly made to its copy. In the event of failure of the main physical server, a copy of the virtual machine on another physical server automatically takes over the load without any delay.
* *DRS* — the resource distribution scheduler (Distributed Resource Scheduler), a function that provides load balancing. In the vSphere platform, this feature makes it possible to dynamically distribute the physical resources of an ESX/ESXi server cluster between virtual machines.
* *Consolidated Backup* — consolidated backup.
* *vSphere SDK* — a feature that provides a standard interface for VMware and third-party software components to access vSphere.
* *vNetwork DVS* — virtual distributed network switch (Distributed Switch).
* *Host Profiles* —  host profiles, a feature that makes it easier to manage the configuration of hosts according to defined company policies. That is, a reference configuration is created, which is taken as a basis for implementation on other company hosts, which significantly reduces the time spent on configuration.
* *PSA* — removable disk array (Pluggable Storage Array), data storage with support for the multipath I/O function.

VMware ESXi - is an enterprise virtualization solution developed by VMware. As with other VMware products, ESXi is available in a free version, with limited functionality, and a paid version with advanced features, such as centralized management of all virtual machines on all project hosts using the vCenter platform. Users note the high stability of the product, ease of administration, minimal code, a wide range of supported guest systems - the main versions of the OS used in the corporate sector.

**Хід роботи**

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2.1) **List the steps for deploying an operating system based on a VirtualBox virtual machine.**

- Create an OS, give it a name and choose a type.

- Select the amount of OS memory.

- Choose the size of the OS file (preferably 20 GB)

- Adjust settings (time zone, language, keyboard)

- Set a new password

2.2) **Are there any hardware limitations when installing 32-bit and 64-bit OS?**

This is what you need to do:

Disable Hyper-V

Disable Device Guard

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

- Start the Hypervisor

- Connect to the Remote machine

- We create a new virtual machine (How to install a virtual machine is specified in Task 2.1)

- When you open CentOS in the boot line you need to enter the word text

2.4) **How can I install Gnome and KDE graphical shells on CentOS if it is already installed in text mode (specify necessary commands and packages)?**

Installing GNOME on CentOS

To install the GUI and GNOME shell, you need to install several groups of packages, which can be done by running the following command:

yum groupinstall basic-desktop desktop-platform x11 fonts

After the installation is complete, run the following command to launch the graphical shell:

Startx

Installing KDE on CentOS

After installing the GUI and GNOME shell as described above, you can install KDE by running:

yum -y groupinstall kde-desktop

After installing KDE, you need to configure which of the two shells to start when starting the X11 GUI. To do this, you need to create a .xinitrc file and write startkde to start the KDE environment or GNOME-session to start the GNOME environment to it.

To create a KDE startup configuration, do:

echo startkde > ~/.xinitrc

Accordingly, to create settings to run GNOME, do:

echo gnome-session > ~/.xinitrc

Note: Both of these commands will overwrite the .xinitrc file, so if you've created it before and made changes, add a line to start the desktop environment manually, for example using the vi text editor.

Now, after setup, launch KDE:

Startx

2.5)

**Give a brief description of the graphical interfaces used in different Linux distributions according to their variant (serial number according to the magazine), table 2..**

**Fluxbox**

Fluxbox is a simple and minimalist window manager for the X Window System.

Fluxbox is based on Blackbox v.0.61.1 and is similar to it - same colors, window layout and full compatibility of themes and styles. It has minimal requirements for system resources and provides all the basic possibilities for organizing comfortable work.

Fluxbox supports such functions as combining several windows in the form of tabs (tabs), menu editing, collapsing applications to the system tray, virtual desktops, flexible tools for grouping windows, customizing the appearance, binding hot keys.

Features of Fluxbox:

* Configurable tabs (allow to combine several identical applications in one window).
* Icon panel (for minimized windows).
* Changing desktops using mouse scrolling.
* Configurable window headers (position of buttons, new buttons).
* KDE support.
* Partial support for GNOME.
* Support for pseudo-transparency.
* UTF-8 support.

**KDE**

KDE is a working shell with an integrated set of cross-platform applications for Linux, Windows, Solaris and Mac.

A versatile integrated environment that allows you to perform everyday tasks without using a command line interface.

In many ways, KDE (K Desktop Environment) is similar to Windows, so users feel at home when using it. As in Win OS, they access the menu by clicking on the left side of the panel. The software has one menu bar at the bottom of the screen, it can be changed at the user's request. With plasma desktops, KDE is the most attractive of all Linux desktops.

**Контрольні запитання**

*Готував матеріал студент: Желевський В.*

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

* *Type 1 hypervisor* (hypervisor, which is installed directly on the computer. The main reasons for installing a Type 1 hypervisor are to run multiple operating systems on a single computer without the overhead of a host OS, or to take advantage of portability and hardware abstraction. Good examples of Type 1 hypervisors are VMware ESXi, Citrix XenServer, and Microsoft Hyper-V).
* *Type 2 hypervisor* (this is what most people are probably familiar with virtual operating systems. It can run multiple operating systems at the same time, but does not have direct access to the hardware and therefore has more overhead when running the guest. This means that the guest operating system will not be running at its full potential, and if your device crashes, you will not be able to access your guests either. Type 2 hypervisors are an ideal way to test multiple operating systems on Windows, OS X, or Linux).

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

*GNU GPL (GNU General Public License)* - is a free software license. Its purpose is to provide the user with the rights to copy, modify and distribute the program and obligations according to which users of all programs derived from it will also receive these rights.

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

If an application is open source, its source code is freely available to its users. Its users - and anyone else - can take this source code, modify it and distribute their own versions of the program. Users also have the ability to distribute as many copies of the original program as they wish. Any person may use the program for any purpose; there are no license fees or other restrictions on the software.

Firefox, Chrome, OpenOffice, Linux and Android are popular examples of open source software, while Microsoft Windows is probably the most popular closed source software.

**4. What is a distribution?**

A distribution - is a set of files prepared for installation. Such a set includes all the necessary components, the installer itself and additional content. These can be both program installers and operating system installers.

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

The main tasks of a system administrator in Linux include:

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

Android is based on the Linux kernel, it stands somewhat apart from the Linux community and Linux infrastructure. Also includes an operating system based on the Linux kernel, a graphical user interface, a web browser, and downloadable end-user applications.

**7. Main capabilities and scope of use of Embedded Linux?**

Embedded operating systems are old news in the tech market, and engineers have developed dozens of them to facilitate hardware and firmware development.

Embedded Linux includes a Linux kernel operating with the help of open-source software development tools and fundamental GNU utilities. Its baseline advantages for developers are readymade pieces of code they can incorporate into their embedded apps. They no longer have to work with cold and empty hardware, developing everything from scratch.

Due to the**scalability**of the Linux operating system and its ability to work on multicore processors, business owners who want to develop complex applications can be sure that the embedded Linux system will easily handle them. This embedded software supports apps that require multiple threads with parallel performance. Thus, you can easily employ embedded Linux for **data processing apps**. Its reliability is so high that even aerospace engineers prefer it for complicated and power-consuming spaceship and satellite firmware.

**8. What is the difference between CLI and GUI modes?**

Differences between CLI and GUI:

* GUI tasks are easy to do and good for beginners. On the other hand, the CLI requires experience with commands and syntax.
* GUI systems require a mouse and keyboard, while the CLI simply requires a keyboard to operate.
* A CLI allows users to manually enter a command to perform a desired task, while a GUI allows users to provide visual effects to interact with the operating system, such as buttons, icons, images, etc.
* The appearance of the CLI cannot be changed. On the contrary, the appearance of the graphical interface is adjustable.
* CLI is faster than GUI.
* GUI has an advantage over flexibility where CLI systems are inflexible.