

Laboratory No. 01 - Base Platform

Objective

- Install and configure different distributions of Unix and Windows operating systems as part of platform setup.
- Become familiar with the use of virtualization software.

Tools to be Used

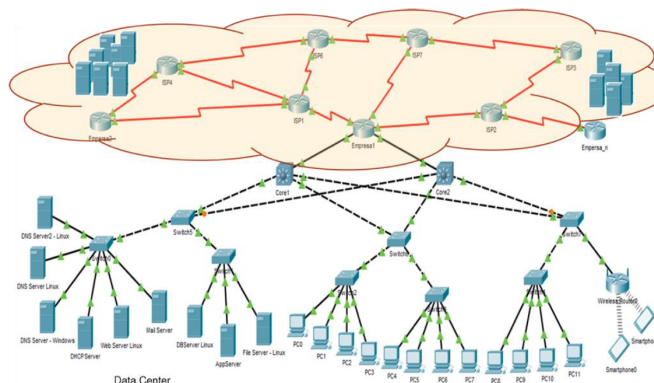
- Items provided by the Computer Laboratory:
 - Computers
 - Internet access
 - Virtualization software
- Items students must bring:
 - Some operating system images.
 - A USB flash drive or an external hard drive with approximately 128 GB of storage (per group).

Introduction

A company typically operates multiple IT infrastructure services, including wired and wireless user workstations, as well as physical and virtualized servers. These components are interconnected through switches (Layer 2 and Layer 3), wireless devices, and routers that provide access to the Internet. Additionally, it is common to leverage cloud infrastructures to provision resources based on the organization's needs.

Within these servers, various services can be hosted, such as web services, DNS, email, databases, storage, and applications, among others.

The following is a possible configuration:



Experiments

We will set up computers within a network using the Computer Laboratory as a base. Various activities will be conducted to help students understand the operating system and user management. Additionally, software tools that support system administration tasks will be required.

Preliminary Note: Computer Laboratory Usage Tests

We will perform operational tests on the Computer Laboratory equipment. Once you have accessed the lab, you will carry out the following activities:

- Install the Linux Slackware, Solaris, and Windows Server operating systems using VMware on a machine (see subsequent sections of this lab). In groups of three students, additionally install CentOS.
- Configure the IP address as follows:
 - IP Address: 10.2.77.n (The instructor will assign a range to each group. IP addresses must not be duplicated among installed systems).
 - Subnet Mask: 255.255.0.0
 - Gateway: 10.2.65.1
 - DNS: 10.2.65.1

1. Virtualization Software

[For groups of 1, 2, and 3 students]

Record a video of up to 5 minutes addressing this topic. All team members submitting the report must participate. You may use a presentation, document, or animation to explain the subject.

- What are hypervisors?
- How are they classified?
- What are their characteristics?
- Explain their architecture.
- What is cloud computing?
- Are hypervisors used in cloud computing? Justify your answer.
- What is the cost difference between a physical server and a cloud-based server?
- What are containers? Explain their architecture.
- What are the similarities and differences between virtual machines and containers?

2. Unix-Based Server Setup

[For groups of 1, 2, and 3 students]

a. Server Installation and Configuration

- Using VMware, create new virtual machines and install Linux Slackware (available at <http://ftp.escuelaing.edu.co/pub/>).

Note: Use expert mode for installation, only installing the necessary packages for basic system operation and network connectivity. Do not install a graphical environment.

- Using VMware, create a new virtual machine and install Solaris. Note: Use expert mode for installation, only installing the required packages for basic system operation and network connectivity. Do not install a graphical environment.
- What files are generated during installation in each virtualization software, and what are their purposes?

- Is it possible to convert a VMware virtual machine to VirtualBox and vice versa?
- Create four users in each operating system and ensure the following:
 - Assign meaningful names. Hint: You may use team members' names (e.g., Claudia, John, Fabian, Diego).
 - Provide each user with a meaningful description. Example: "User with the professor's first name" for a user named Claudia.
 - Each user should have a home directory matching their username, located in the `/usuarios` directory at the root of the main file system.
 - What is the file system? Which one did you use during installation? What are its characteristics?
 - Create two groups: "Accounting" and "IT."
 - The first two users should belong exclusively to the "Accounting" group, while the other two should be part of the "IT" group.
- Initially, set up network configurations automatically using DHCP and configure the machines in bridge mode. What do "Bridge Mode" and "NAT Mode" mean? What IP address was assigned to the machine?
- Manually configure the virtual machines' IP addresses using the details provided in the initial clarification.
- Test the operating system's network functionality by performing the following checks:
 - Check your computer's IP address (host computer). Use the `ipconfig` command in Windows or `ifconfig` (or equivalent) in Linux.
 - Use the `ping` command to test connectivity:
 - * `ping 10.2.77.n` (the machine being configured)
 - * `ping 10.2.65.1`
 - * `ping 8.8.8.8`
 - * `ping 10.2.77.m` (another machine in your group or another group)
 - * `ping www.google.com`
- Compare the installation experiences of the operating systems.
- Document the installation process.

b. Understanding and Managing Operating Systems

- What is the directory structure of the installed operating systems? List the directories, describe their content, and compare Slackware and Solaris.
 - Where are the system configuration files located?
 - Where are the system executables stored? If they are in multiple locations, explain why.
 - Where are the system log files stored? What are their purposes?
 - Where are external storage devices (USB drives, external hard drives) typically mounted? Connect a USB drive and configure it to be visible in the virtual machine. What commands did you use?
 - What differences do you observe between the operating systems regarding the file system structure?
- What are system log files?
- What is syslog? What are the main files related to syslog? What types of information are recorded in log files? What is their structure? Provide five examples of logged events. Does syslog work on the installed operating systems?
- How do permissions work in the installed operating systems? Explain how to modify permissions using character and numeric representations.
- Change user and group permissions to observe their impact. For example, allow or restrict users from creating files in other users' directories, executing programs, opening files, or modifying files.

3. Windows Server Installation and Configuration – Phase 1

[For groups of 1, 2, and 3 students]

1. Create a new virtual machine using VMware and install Windows Server without a graphical interface.
Note: Do not configure Active Directory.
2. Set up network operation in Bridge Mode and configure the network according to the initial clarification.
3. Test system functionality by executing the following commands:
 - `ping host_computer_ip`
 - `ping 8.8.8.8`
 - `ping www.google.com`
4. Document the installation process.

4. Windows Server Installation and Configuration – Phase 2

[For groups of 1, 2, and 3 students]

- Install the graphical version of Windows Server using VMware.
- Create four users.
- How are permissions managed in Windows Server?
- What is the directory structure of Windows Server?
- What is the Windows Registry? What is its purpose? How is it edited? What type of information does it store?
- Assign different permission levels to the created users.
- How are Windows Server logs accessed?
- Identify server log events such as failed login attempts, user access, and unauthorized actions (e.g., attempting to delete a file without permission).
- Document the process.

5. Android Installation

[For groups of 1, 2, and 3 students]

- Create a new virtual machine using VMware and install Android.
- Configure network connectivity and test its operation as done with Linux.

6. Command Line Knowledge

[For groups of 1, 2, and 3 students]

Understanding the operating system requires knowledge of basic commands and its shell. Perform the following tasks:

- What is the shell?
- Which shells are supported by Slackware, Solaris, and Windows?
- What are their differences? Compare Unix-based shells separately from Windows shells.
- Identify, explain, and provide examples of commands in Linux, Unix, and Windows for the following tasks:
 1. Change directories
 2. List directory structures and files

3. Copy or move a file
4. View file content without editing
5. Edit a file
6. View the first and last lines of a file
7. Search for a word in a file
8. Locate a file in the system

Notes

1. Present the execution of your virtual machines to your instructor (a total of 5 or 6 machines, depending on the number of students in the group).
2. Review the operation of the commands from the last section with your instructor.
3. The operating system version used should be the latest stable release.
4. All virtual machines must be configured to obtain independent IP addresses, separate from the physical (host) machine.