COMP311 Liux Lab

جامعة بيرزيت
BIRZEIT UNIVERSITY

Project No. 3

Comp311 (Summer 2023): Linux OS Laboratory

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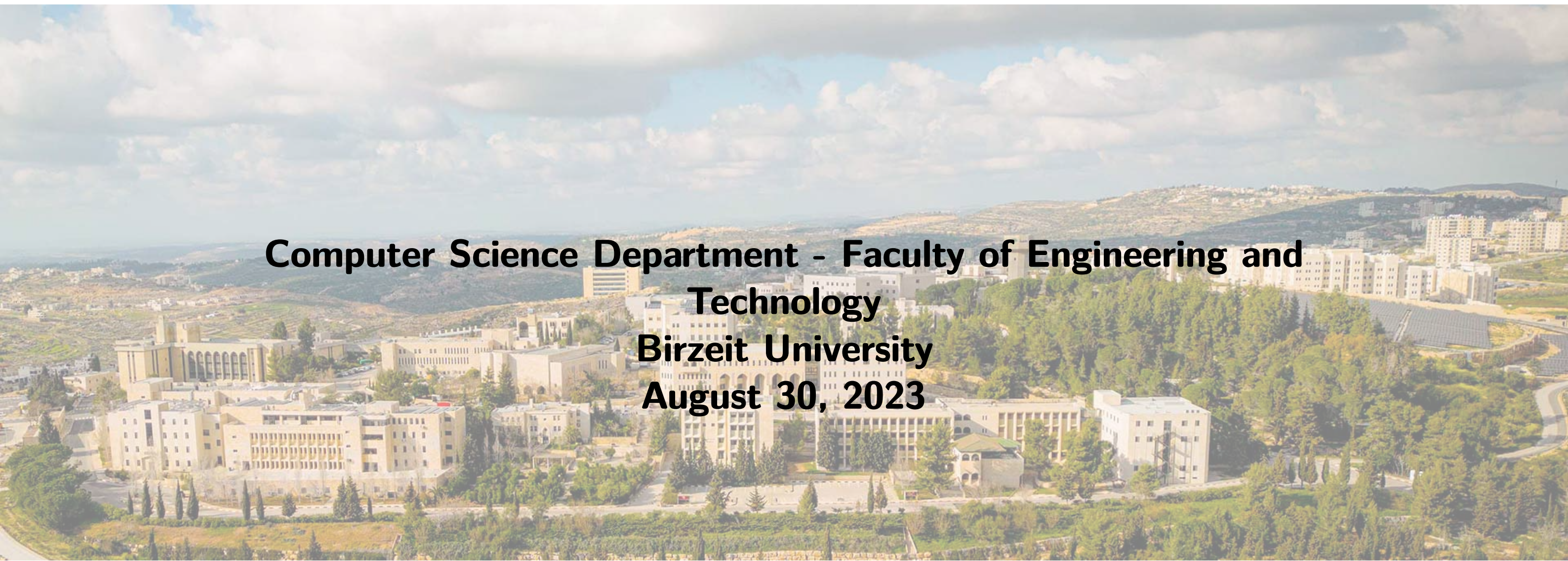

Computer Science Department - Faculty of Engineering and Technology
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Second Project Objectives

The following are the objectives of the first project:

- Demonstrate your understanding of bash scripting.

  The project will be evaluated based on your ability to apply fundamental concepts of bash scripting. This includes demonstrating your knowledge of scripting variables, loops, conditionals, and commands covered in the course.

- Demonstrate your ability to apply what you have learned through the course in implementing the bash scripting.

  The project aims to gauge your capacity to translate theoretical knowledge into practical application. Your script's functionality, structure, and approach should align with the principles, techniques, and best practices introduced in the course.

Project Guidelines

On your virtual machine, do the following:

- Create a sub-directory under your home directory called youruserid_proj3 (e.g. **u11342145_proj3**), ***Please stick closely with the naming conventions!!***.
- Every created script file must contain comments about your full name and registration ID, and a simple description about the code inside the script file ***(ALL files)***.
- It is not allowed to use any commands from outside of the Lab manual unless they are mentioned in the task description. As a general rule, use the commands from the manual. If a required command is not available in the manual, you may use any appropriate command as needed.

Project Title: Admin Utilities Management System in Bash Script

Project Description

In this project, you will create a set of simple admin utilities using Bash scripting. These utilities will help perform basic administrative tasks on a Linux system. The utilities will be menu-driven, providing a user-friendly interface to execute various functions.

Project Requirements

Main Menu

Create a main menu with the following options:

- Login as admin
- View system information
- Exit

Login as admin

The system shall prompt a user to enter a passcode, which is hard-coded in the script and shall be hidden (password-like). If it is true, A sub-menu called Admin Utilities will appear that contains the following items:

- Memory Usage
- CPU Usage
- Disk Usage
- Who's There.
- Show Network Information

Memory, CPU and Memory usage

1. Set the threshold value: The script uses a predefined threshold value (set it to 80) to determine if the memory usage is high. You can adjust this value to suit your needs by changing the value of the threshold variable at the beginning of the script.
2. Check the current memory usage: The script uses the `free` command to check the current memory usage. And calculates the percentage of used memory by dividing the used memory by the total memory and multiplying it by 100.
3. Check the current CPU usage: The script uses the `top` command to check the current CPU usage. It calculates the percentage of used CPU by adding the user and system CPU usage values reported by `top`.
4. Check the current desk usage: The script uses the `df` command to check the current desk usage and report the percentage.
5. Compare usage to the threshold: The script compares the current metrics from CPU, memory, and desk usage to the threshold value.
6. Send email notification: If the metrics usage is above the threshold, the script sends an email notification to the system administrator (assume it is the effective username of the current user) using the mail command.
7. Print message: The script prints a message indicating whether the memory usage is above or below the threshold.

Who's There

When this option is chosen, the script lists currently logged-in users and their respective full names along with their current tasks.

Show Network Information

When this option is selected, the script will display the network information including, the IP address, MAC address, and the number of TCP connections (use netstat command)

View System Information

When this option is selected, the script will display essential system information, such as:

- Hostname
- Operating System
- Kernel Version
- CPU Information

Exit

This option will allow the admin to exit the script.

Audit of Project Implementation

Code Modularity

The implementation of the project demonstrates good modularity by dividing the code into smaller scripts based on functionality. This approach enhances code readability, maintainability, and reusability. Each major functionality is encapsulated within its script, making the main script more concise and organized.

Menu-driven Approach

The menu-driven approach for user interaction is effectively employed. The main script presents the user with a menu of options, making the user experience more intuitive and user-friendly. By utilizing the case statement to handle user choices, the code structure remains clear and understandable.

Functionality Segmentation

Each option in the menu corresponds to a specific functionality, and the code associated with each functionality is encapsulated within separate scripts. This segmentation allows for focused development and easier debugging of individual functionalities.

Readability and Maintainability

The use of smaller scripts for individual functionalities enhances code readability and maintainability. Each script has a specific purpose, making it easier for developers to understand and modify the code. This approach contributes to reducing the complexity of the main script.

Effective Use of Functions (Best Practices)

By breaking down the code into smaller scripts, the project demonstrates effective use of functions. Each script encapsulates a set of related actions, promoting code reusability. Functions are invoked within the main script's case statement, keeping the main script concise and focused.

Implementation Steps

- Create a Bash script file (e.g., `admin_utilities.sh`).
- Implement a loop to continuously display the main menu until the "Exit" option is chosen.
- Divide the code into smaller junks (scripts) based on the functionality and just call the intended script inside the case statement instead of implementing all of the code as one piece.
- Display appropriate messages and prompts to guide the admin through each action.
- Ensure error handling for invalid inputs and edge cases.

Example Usage

```bash
#!/bin/bash

while true; do
    clear
    echo "==== Simple Admin Utilities ===="
    echo "1. Login as admin"
    echo "2. View System Information"
    echo "3. Exit"

    read -p "Enter your choice: " choice

    case $choice in
        1)
            # Login as admin
            ;;
        2)
            # Display system information function
            ;;

        3)
            echo "Exiting..."
            exit
            ;;
        *)
            echo "Invalid choice. Please select a valid option."
            ;;
    esac
done
```

1 | Deliverable

> **The project submission deadline is Sunday, August 9, 2023. All project submissions are expected to be completed using the ITC. While the Project discussion will be after the final exam in Tuesday, September 12-2023**

Please turn in the file **youruserid_proj3.tar** and upload it to the ITC by the due date and time.

Note:

- You should do all the work above completely on your own.
- No projects will be accepted after the due date (9/09/2023).
- Projects' discussion will be conducted after the final exam at (12/09/2023).
- *We want to emphasize that cheating in any form is strictly prohibited. If any student is found to have engaged in cheating, whether from external sources or otherwise, appropriate actions will be taken according to our established policies.*

Good Luck!