PROJECT REPORT

Title: Bash Scripting Suite for System Maintenance (Assignment 5)

Objective:
To develop a set of Bash scripts to automate daily system maintenance tasks including system backups, software updates, cleanup, and log monitoring.

Introduction

System maintenance is an essential task for ensuring system stability and performance in Linux environments. Manually performing backups, updates, and log monitoring can be time-consuming and error-prone. This project focuses on automating these tasks through Bash scripting.

The suite consists of four main scripts and one library script for logging. Each script handles a specific maintenance task, and they are combined under a menu-driven interface for ease of use.

Project Timeline

Day	Task Completed
Day 1	Developed script for automated backup
Day 2	Created script to perform system update and cleanup
Day 3	Built log monitoring script to detect critical system events
Day 4	Combined all scripts under a menu-driven suite
Day 5	Tested scripts, improved error handling and logging

```
priyansu@Lenovo:~$ cd /mnt/e
priyansu@Lenovo:/mnt/e$ cd CapstoneProject
priyansu@Lenovo:/mnt/e/CapstoneProject$ nano Lib.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$ chmod +x Lib.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$
priyansu@Lenovo:/mnt/e/CapstoneProject$ nano BackUp.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$ chmod +x BackUp.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$
priyansu@Lenovo:/mnt/e/CapstoneProject$ nano Update_CleanUp.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$ chmod +x Update_CleanUp.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$
priyansu@Lenovo:/mnt/e/CapstoneProject$ nano LogMonitor.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$ chmod +x LogMonitor.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$
priyansu@Lenovo:/mnt/e/CapstoneProject$ nano MaintenanceMenu.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$ chmod +x MaintenanceMenu.sh
priyansu@Lenovo:/mnt/e/CapstoneProject$
```

Navigating to the project directory and making all Bash scripts executable.

Lib.sh

```
#!/bin/bash
ROOT_DIR="$(pwd)"
LOG_FOLDER="$ROOT_DIR/logs"
mkdir -p "$LOG_FOLDER"
LOG_FILE="$LOG_FOLDER/activity.log"
write_log() {
  echo "$(date '+%Y-%m-%d %H:%M:%S') :: $1" | tee -a "$LOG_FILE"
}
```

BackUp.sh

```
#!/bin/bash
source "$(pwd)/Lib.sh"
read -p "Enter folder to back up (leave blank for current directory): " INPUT
TARGET="${INPUT:-$(pwd)}"

if [[ ! -d "$TARGET" ]]; then
  write_log "ERROR: '$TARGET' is not a valid directory."
  exit 1
fi
DEST="$ROOT_DIR/backups"
mkdir -p "$DEST"

TIME_TAG=$(date +"%Y%m%d_%H%M%S")
ARCHIVE="Backup_$(basename "$TARGET")_$TIME_TAG.tar.gz"
write_log "Creating backup for $TARGET ..."
if tar -czf "$DEST/$ARCHIVE" -C "$(dirname "$TARGET")" "$(basename "$TARGET")"; then
  write_log "Backup saved at: $DEST/$ARCHIVE"
else
  write_log "Backup process failed."
Fi
```

```
========= SYSTEM MAINTENANCE MENU =========
1) Create Backup
2) System Update + Cleanup
3) Monitor System Logs
4) Exit
====================================
Choose an option: 1
Enter folder to back up (leave blank for current directory): /mnt/d/Documents/7th Sem
2025-11-09 00:48:36 :: Creating backup for /mnt/d/Documents/7th Sem ...
2025-11-09 00:48:43 :: Backup saved at: /mnt/e/CapstoneProject/backups/Backup_7th Sem_20251109_004836.tar.gz
```

Running the backup script from the maintenance menu and successfully creating a compressed backup archive.

```
========= SYSTEM MAINTENANCE MENU =========
1) Create Backup
2) System Update + Cleanup
3) Monitor System Logs
4) Exit
====================================
Choose an option: 1
Enter folder to back up (leave blank for current directory): /mnt/d/Documents/6th Sem
2025-11-09 00:49:19 :: ERROR: '/mnt/d/Documents/6th Sem' is not a valid directory.
```

Backup script showing proper error handling when a non-existent directory is entered.

Update_CleanUp.sh

```
#!/bin/bash

source "$(pwd)/Lib.sh"
write_log "Starting system update..."

if sudo apt update -y && sudo apt upgrade -y; then
  write_log "System updated successfully."
else
  write_log "System update encountered errors."
fi

write_log "Cleaning unused packages..."
sudo apt autoremove -y >/dev/null 2>&1
sudo apt clean

write_log "Cleanup complete."
```

```
========= SYSTEM MAINTENANCE MENU =========
1) Create Backup
2) System Update + Cleanup
3) Monitor System Logs
4) Exit
=====================================
Choose an option: 2
2025-11-09 00:49:24 :: Starting system update...
[sudo] password for priyansu:
Hit:1 http://archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Fetched 384 kB in 3s (148 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
Get more security updates through Ubuntu Pro with 'esm-apps' enabled:
  gsasl-common libgsasl7
Learn more about Ubuntu Pro at https://ubuntu.com/pro
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
2025-11-09 00:49:35 :: System updated successfully.
2025-11-09 00:49:35 :: Removing unused packages and cleaning cache...
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
2025-11-09 00:49:37 :: Cleanup complete.
```

Execution of system update and cleanup script showing the update and package cleanup process.

LogMonitor.sh

```
#!/bin/bash

source "$(pwd)/Lib.sh"

read -p "Enter log file to monitor (default: /var/log/syslog): " LOG_PATH
LOG_PATH="${LOG_PATH:-/var/log/syslog}"
```

```
write_log "Monitoring $LOG_PATH for critical logs..."

tail -f "$LOG_PATH" | grep --line-buffered -Ei "error|fail|warning|critical" | while read LINE
do
  write_log "Log Alert: $LINE"
done
```

```
========= SYSTEM MAINTENANCE MENU =========
1) Create Backup
2) System Update + Cleanup
3) Monitor System Logs
4) Exit
====================================
Choose an option: 3
Enter log file to monitor (default: /var/log/syslog):
2025-11-09 00:57:39 :: Monitoring /var/log/syslog for warning or error entries.(Press CTRL+C to stop)
^C
```

Starting the log monitoring script to watch for critical, warning, and error log entries.

```
========= SYSTEM MAINTENANCE MENU =========
1) Create Backup
2) System Update + Cleanup
3) Monitor System Logs
4) Exit
====================================
Choose an option: 3
Enter log file to monitor (default: /var/log/syslog):
2025-11-09 00:58:00 :: Monitoring /var/log/syslog for warning or error entries.(Press CTRL+C to stop)
2025-11-09 00:59:45 :: ALERT: CRITICAL: Kernel memory allocation failed at module load.
2025-11-09 01:00:12 :: ALERT: Test ERROR from Priyansu
2025-11-09 01:01:11 :: ALERT: Nov  9 01:01:11 Lenovo priyansu: There is an error : System failed to authenticate
^C
```

Log monitoring script detecting and logging system error messages in real time.

```
priyansu@Lenovo:~$ echo "CRITICAL: Kernel memory allocation failed at module load." | sudo tee -a /var/log/syslog
[sudo] password for priyansu:
CRITICAL: Kernel memory allocation failed at module load.
priyansu@Lenovo:~$ echo "Test ERROR from Priyansu" | sudo tee -a /var/log/syslog
Test ERROR from Priyansu
priyansu@Lenovo:~$ logger "There is an error : System failed to authenticate"
priyansu@Lenovo:~$
```

Injecting test log events into /var/log/syslog using echo, tee, and logger commands to verify that the log monitoring script detects and logs errors correctly.

MaintenanceMenu.sh

```
#!/bin/bash

while true; do
  echo ""
  echo "========= SYSTEM MAINTENANCE ========="
  echo "1) Create Backup"
  echo "2) System Update + Cleanup"
  echo "3) Monitor System Logs"
  echo "4) Exit"
```

```
  echo "====================================="
  read -p "Choose an option: " CHOICE

  case "$CHOICE" in
    1) ./BackUp.sh ;;
    2) ./Update_CleanUp.sh ;;
    3) ./LogMonitor.sh ;;
    4) echo "Exiting..."; break ;;
    *) echo "Invalid option. Try again." ;;
  esac
done
```

```
priyansu@Lenovo:/mnt/e/CapstoneProject$
priyansu@Lenovo:/mnt/e/CapstoneProject$ ./MaintenanceMenu.sh

========= SYSTEM MAINTENANCE MENU =========
1) Create Backup
2) System Update + Cleanup
3) Monitor System Logs
4) Exit
=====================================
Choose an option:
```

Main maintenance menu displayed, allowing user to choose maintenance tasks through a menu-driven interface.

```
priyansu@Lenovo:/mnt/e/CapstoneProject$ cat logs/activity.log
2025-11-09 00:48:36 :: Creating backup for /mnt/d/Documents/7th Sem ...
2025-11-09 00:48:43 :: Backup saved at: /mnt/e/CapstoneProject/backups/Backup_7th Sem_20251109_004836.tar.gz
2025-11-09 00:49:19 :: ERROR: '/mnt/d/Documents/6th Sem' is not a valid directory.
2025-11-09 00:49:24 :: Starting system update...
2025-11-09 00:49:35 :: System updated successfully.
2025-11-09 00:49:35 :: Removing unused packages and cleaning cache...
2025-11-09 00:49:37 :: Cleanup complete.
2025-11-09 00:57:39 :: Monitoring /var/log/syslog for warning or error entries.(Press CTRL+C to stop)
2025-11-09 00:58:00 :: Monitoring /var/log/syslog for warning or error entries.(Press CTRL+C to stop)
2025-11-09 00:59:45 :: ALERT: CRITICAL: Kernel memory allocation failed at module load.
2025-11-09 01:00:12 :: ALERT: Test ERROR from Priyansu
2025-11-09 01:01:11 :: ALERT: Nov  9 01:01:11 Lenovo priyansu: There is an error : System failed to authenticate
priyansu@Lenovo:/mnt/e/CapstoneProject$
```

Displaying the activity.log file containing the recorded backup events, errors, updates, and log alerts.

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BATCH : 7