CSE-478: Introduction to Computer Security

Lab 1: Basic Linux Familiarity

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Objective:

To gain basic familiarity with Linux commands, file systems, user permissions, process management, and scripting.

1. UNIX and Linux Overview

UNIX was developed by Ken Thompson at Bell Labs in 1969 as a multitasking, multiuser system. Linux was created by Linus Torvalds in 1991 as an open-source UNIX-like operating system. It is widely used for its stability, flexibility, and community-driven development.

2. Terminal and Shell

The terminal provides access to the command-line interface. The shell interprets user commands. Example commands include `pwd` (print working directory), `ls` (list files), and `man` (view manual pages).

3. File System Structure

Linux uses a hierarchical structure starting from the root directory `/`. Key directories: `/bin` (essential binaries), `/etc` (config files), `/home` (user directories), `/usr` (user utilities), `/var` (logs).

4. File Permissions

Permissions are divided into user, group, and others with read (r), write (w), and execute (x) rights. Use `ls -l` to view permissions, `chmod` to modify, and `chown` to change ownership. Example: `chmod 764 file.txt`. Common modes: 755 (executables), 644 (text files).

5. Environment Variables

`echo $PATH` shows executable paths, and `$HOME` indicates the user's directory. Add paths using `export PATH=/custom/path:$PATH`. Environment variables configure user and system environments.

6. Input/Output Redirection and Piping

Redirect output with `>` (overwrite) or `>>` (append). Combine commands using pipes `|`, e.g., `ls | grep txt` filters text files. Redirect errors with `2> file` or `2>&1`.

7. Process Management

Use `ps aux` to view processes, `kill PID` to terminate one, and `bg`/`fg` to manage background/foreground tasks. Example: `ping 127.0.0.1 &` runs a background job.

8. Text Viewing and Editing

Use `cat`, `more`, and `less` to view files safely. `less` allows scrolling both ways and searching. Example: `less /etc/passwd`. Avoid editing configuration files with GUI editors without backup.

9. Shell Scripting

Create a file `hello.sh` with content: `#!/bin/bash` and `echo 'Hello World'`. Make it executable using `chmod +x hello.sh` and run with `./hello.sh`.

10. Log Files

System logs are stored in `/var/log`. Use `tail -f /var/log/syslog` to view live logs and `grep cron /var/log/syslog` to filter for cron-related messages.

Conclusion:

Through this lab, I learned fundamental Linux operations, including navigating the file system, managing permissions, controlling processes, and writing basic shell scripts. These are foundational skills for system security and administration.