# LPIC-1 Exam Workbook

*A Chapter-by-Chapter Syllabus with Practice Questions*

**Version 1.0**

**Author:** Your Name
**Date:** January 1, 2025

# Contents

# Chapter 1

# Topic 101: System Architecture

## 1.1   101.1 Determine and Configure Hardware Settings

**Reference to LPI Objectives:**

- **LPIC-1 v5, Exam 101, Objective 101.1**

- **Weight: 2**

**Key Knowledge Areas**

- Enabling/disabling integrated peripherals (BIOS/UEFI).

- Identifying different types of mass storage devices.

- Determining hardware resources for devices (IRQ, DMA, etc.).

- Using tools (`lsusb`, `lspci`, `lsmod`) for hardware inspection.

- Manipulating USB devices.

- Understanding `sysfs`, `udev`, and `dbus` concepts.

**Important Files, Terms, and Utilities**

- `/sys/`

- `/proc/`

- `/dev/`

- `modprobe`

- `lsmod`

- `lspci`

- `lsusb`

# Lesson Overview

Modern computers rely on standards for firmware and hardware interaction. On x86 platforms, the firmware could be traditional **BIOS** or newer **UEFI**. Both allow for configuring hardware resources (e.g., integrated peripherals, IRQs, DMA settings) even before the operating system loads.

Once Linux is running, device detection and configuration rely on the kernel and support from user-space utilities such as `lspci`, `lsusb`, `lsmod`, and various pseudo-filesystems in `/proc` and `/sys`.

## 1. BIOS and UEFI Configuration

- **Accessing Firmware:** Typically press `Del`, `F2`, or `F12` at startup.

- **Common Configurations:**

  - Enable/disable integrated peripherals (USB ports, onboard audio, etc.).
  - Set boot order and define the primary device for the bootloader.
  - Adjust CPU features or RAM parameters if needed.

- **Impact:** Misconfiguration (e.g., wrong boot device) can prevent the OS from loading.

## 2. Device Detection in Linux

**Goal:** Match hardware parts to the correct driver (*kernel module*).

1. **Check if hardware is detected** (e.g., `lspci`, `lsusb`).

2. **Verify if a driver is loaded** (e.g., `lsmod`, `lspci -k`).

3. **Confirm functionality** via logs, testing, or additional tools.

## 3. Commands for Hardware Inspection

`lspci`

- Lists PCI devices (graphics cards, network interfaces, etc.).

- Use `-v` for more detail and `-k` to see which kernel modules are in use.

`lsusb`

- Lists USB devices (keyboards, mice, USB hubs, etc.).

- Use `-v` for verbose output and `-d <vendor:product>` to focus on a specific device.

`lsmod`

- Shows loaded kernel modules.

- Columns: **Module**, **Size**, **Used by**.

`modprobe`

- Loads or unloads modules (with dependencies).

- `modprobe -r <module>` removes a module if not in use.

- `modinfo <module>` shows module details (author, license, parameters).

## 4. Hardware Information Files

- **/proc** (pseudo-filesystem for processes and hardware info) Examples: `/proc/cpuinfo`, `/proc/interrupts`, `/proc/ioports`, `/proc/dma`.

- **/sys** (sysfs for device and kernel data) Mirrors hardware hierarchy, used heavily by `udev`.

- **/dev** (device files) Each entry represents a device (e.g., `/dev/sda1`, `/dev/fd0`). `udev` dynamically creates/removes these files as devices connect or disconnect.

## 5. Storage Devices

- **Block Devices**: Accessed in fixed-size blocks (hard disks, SSDs, etc.).

- **Naming Conventions**:

  - Newer kernels use `sd` prefix for most disks (`/dev/sda1`).
  - IDE devices also appear as `sd` on modern kernels.
  - NVMe devices get names like `/dev/nvme0n1p1`.
  - SD Cards often appear as `/dev/mmcblk0p1`.

- **Hotplug and Coldplug**:

  - **Hotplug**: device recognized after boot (e.g., USB).
  - **Coldplug**: device recognized during boot (built-in or already connected).

## Workbook Exercises

1. **Accessing BIOS/UEFI**

   - Reboot a test machine and enter BIOS/UEFI.

   - Locate the sections that let you enable/disable integrated peripherals.

   - Identify the menu where boot order is set.

2. **Listing Hardware**

   - On a Linux system, run `lspci -k`.

     - Identify which driver is used by the video card.

   - Run `lsusb -t`.

     - Check which USB driver modules are in use (e.g., `btusb`, `usbhid`).

3. **Exploring /proc and /sys**

   - View CPU details with `cat /proc/cpuinfo`.

   - Inspect interrupts with `cat /proc/interrupts`.

   - Explore `/sys/class` and `/sys/block` to see how devices are represented.

4. **Managing Kernel Modules**

   - Use `lsmod` to list all loaded modules.

   - Pick a module (e.g., a sound driver) and unload it with `sudo modprobe -r <module>`.

     - Check if removal is allowed (the module should not be in use).

   - Use `modinfo -p <module>` to see possible parameters, and note how you might apply them in `/etc/modprobe.d/`.

5. **Blacklisting a Module**

   - Create a test file in `/etc/modprobe.d/` to blacklist an unwanted module (e.g., `nouveau`).

   - Reboot and confirm it is not loaded by checking `lsmod`.

## Summary

- Modern systems rely on firmware (BIOS/UEFI) for initial hardware configuration.

- Linux identifies devices via kernel modules; tools like `lspci`, `lsusb`, `lsmod`, and `modprobe` allow you to inspect and manage hardware.

- `/proc` and `/sys` provide detailed, real-time system information; `udev` dynamically manages device nodes in `/dev`.

- Storage device naming follows standard patterns (`sd`, `nvme`, `mmcblk`, etc.).

- Understanding how to enable/disable devices, load/unload modules, and explore hardware information files is crucial for system administration and LPIC-1 success.

# Multiple-Choice Questions for 101.1

1. When trying to enable or disable motherboard-integrated peripherals, which component of the system is typically used?

   A) The BIOS or UEFI configuration utility

   B) The Linux kernel's initrd

   C) The /boot partition

   D) The lsusb command

2. Which command lists devices currently connected to the PCI bus?

   A) modprobe

   B) lsmode

   C) lspci

   D) lshw

3. Which of the following commands helps you list USB devices in a tree-like hierarchy?

   A) lsusb -a

   B) lsusb -s

   C) lsusb -f

   D) lsusb -t

4. To remove a kernel module (along with its dependencies) while the system is running, which command should be used?

   A) modinfo -r

   B) modprobe -r

   C) rmmod –all

   D) lsmod -r

5. On modern Linux systems, SATA disks are generally identified as which kind of device name?

   A) /dev/sdX

   B) /dev/hdX

C) /dev/nvmeXnY

D) /dev/fdX

6. Which file below would you edit to permanently blacklist a problematic kernel module such that it doesn't load automatically?

A) /etc/rc.local

B) /etc/modprobe.d/blacklist.conf

C) /boot/grub/grub.cfg

D) /proc/blacklist/modules

7. Which pseudo-filesystem is most specifically devoted to storing device and kernel data related to hardware?

A) /dev

B) /proc

C) /sys

D) /home

8. Which command line will show a specific USB device's verbose information using its vendor:product ID (e.g., 1781:0c9f)?

A) lsusb -d 1781:0c9f -v

B) lsusb -p 1781:0c9f -v

C) lsusb -i 1781:0c9f

D) lsusb -v -s 01:02

9. In the output of `lsmod`, the "Used by" column indicates:

A) The file size of the module on disk

B) The user-level applications that installed the module

C) The modules or processes depending on that module

D) Kernel version compatibility for that module

10. If you need to confirm which kernel driver is in use by a particular PCI device, which `lspci` option combination is most helpful on recent distributions?

A) lspci -m

B) lspci -k

C) lspci -D

D) lspci –driver

11. What does the output of `lsusb -t` specifically highlight that differs from plain `lsusb`?

   A) The exact partition layout of attached USB drives

   B) A hierarchical (tree-like) representation of USB devices and drivers

   C) The SCSI ID mappings of USB-attached devices

   D) A summary of device's kernel modules only

12. Which best describes the function of the `modinfo` command?

   A) It removes the specified module from the kernel

   B) It displays all processes currently using a kernel module

   C) It lists detailed information about a specified module, including parameters

   D) It inserts the specified module and resolves dependencies

13. What is the role of `udev` on a modern Linux system?

   A) It is a pseudo-filesystem used to track hardware devices in /sys

   B) It permanently stores device drivers in /boot

   C) It manages device nodes in /dev, handling hotplug/coldplug events

   D) It only configures CPU frequency scaling

14. Which file inside `/proc` would you inspect to see how many interrupts have occurred for each device?

   A) /proc/ioports

   B) /proc/dma

   C) /proc/cpuinfo

   D) /proc/interrupts

15. If a device is recognized by the kernel but not functioning correctly, which of the following is the most likely underlying cause?

   A) The BIOS is not set to read the device's firmware

   B) The associated kernel module (driver) is not loaded or is misconfigured

   C) The CPU lacks the required SSE instruction set

   D) The device was not assigned a correct IRQ in the /etc/fstab

16. Which file is typically used to pass persistent module load options like `options nouveau modeset=0`?

   A) /etc/udev/rules.d/99-custom.rules

   B) /proc/meminfo

C) /etc/modprobe.d/<module>.conf

D) /etc/modules-load.d/module.options

17. What is the main purpose of SysFS (`/sys`) in a Linux system?

A) Stores process information like CPU usage

B) Holds user configuration data for /home

C) Exports device and driver information from the kernel to user space

D) Contains scripts to mount all system filesystems

18. Which command is most appropriate for listing all currently loaded kernel modules?

A) ls -la /lib/modules/$(uname -r)

B) depmod -a

C) lsmod

D) insmod

19. To selectively unload the `snd-hda-intel` module along with related dependent modules, which command would you use?

A) `modinfo snd-hda-intel -remove`

B) `lsmod -unload snd-hda-intel`

C) `depmod -r snd-hda-intel`

D) `modprobe -r snd-hda-intel`

20. If you see a disk labeled as `/dev/mmcblk0p1`, it is most likely:

A) A SATA SSD

B) An older IDE HDD

C) An SD card or MMC device

D) A USB DVD drive

## Fill-in-the-Blank Questions for 101.1

1. The older firmware commonly used before the UEFI standard is called _____.

2. The _____ command lists all kernel modules currently loaded into the system.

3. A kernel module responsible for controlling hardware in Linux is often referred to as a _____.

4. The Linux subsystem that manages device node creation in `/dev` and handles hotplug/coldplug events is called _____.

5. The special, memory-based filesystem used for storing process and hardware information is the _____ directory.

6. To configure boot device priority and enable or disable onboard peripherals, a user must typically access the _____ or UEFI setup utility.

7. In Linux, disks commonly appear under `/dev` as _____ devices (e.g., `/dev/sda`, `/dev/sdb`) on modern systems.

8. The _____ command is used to insert or remove kernel modules and their dependencies.

9. When blacklisting a kernel module to prevent it from loading automatically, the configuration file is often placed in _____.

10. To see a hierarchical (tree-like) view of USB devices and the drivers handling them, you can run _____ with the `-t` option.

## 1.2 101.2 Boot the System

*[Brief syllabus and questions to be added here]*

## 1.3 101.3 Change Runlevels / Boot Targets and Shutdown or Reboot System

*[Brief syllabus and questions to be added here]*

# Chapter 2

# Topic 102: Linux Installation and Package Management

## 2.1    102.1 Design hard disk layout

*[Brief syllabus and questions to be added here]*

## 2.2    102.2 Install a boot manager

*[Brief syllabus and questions to be added here]*

## 2.3    102.3 Manage shared libraries

*[Brief syllabus and questions to be added here]*

## 2.4    102.4 Use Debian package management

*[Brief syllabus and questions to be added here]*

## 2.5    102.5 Use RPM and YUM package management

*[Brief syllabus and questions to be added here]*

## 2.6    102.6 Linux as a virtualization guest

*[Brief syllabus and questions to be added here]*

# Chapter 3

# Topic 103: GNU and UNIX Commands

## 3.1 103.1 Work on the command line

*[Brief syllabus and questions to be added here]*

## 3.2 103.2 Process text streams using filters

*[Brief syllabus and questions to be added here]*

## 3.3 103.3 Perform basic file management

*[Brief syllabus and questions to be added here]*

## 3.4 103.4 Use streams, pipes and redirects

*[Brief syllabus and questions to be added here]*

**103.4 Lesson 1**

*[Brief syllabus and questions to be added here]*

## 3.5 103.5 Create, monitor and kill processes

*[Brief syllabus and questions to be added here]*

## 3.6 103.6 Modify process execution priorities

*[Brief syllabus and questions to be added here]*

**103.6 Lesson 1**

*[Brief syllabus and questions to be added here]*

## 3.7 103.7 Search text files using regular expressions

*[Brief syllabus and questions to be added here]*

## 3.8 103.8 Basic file editing

*[Brief syllabus and questions to be added here]*

# Chapter 4

# Topic 104: Devices, Linux Filesystems, Filesystem Hierarchy Standard

## 4.1  104.1 Create partitions and filesystems

*[Brief syllabus and questions to be added here]*

## 4.2  104.2 Maintain the integrity of filesystems

*[Brief syllabus and questions to be added here]*

## 4.3  104.3 Control mounting and unmounting of filesystems

*[Brief syllabus and questions to be added here]*

## 4.4  104.5 Manage file permissions and ownership

*[Brief syllabus and questions to be added here]*

**104.5 Lesson 1**

*[Brief syllabus and questions to be added here]*

## 4.5  104.6 Create and change hard and symbolic links

*[Brief syllabus and questions to be added here]*

## 4.6 104.7 Find system files and place files in the correct location

*[Brief syllabus and questions to be added here]*

# Chapter 5

# Topic 105: Shells and Shell Scripting

## 5.1   105.1 Customize and use the shell environment

*[Brief syllabus and questions to be added here]*

## 5.2   105.2 Customize or write simple scripts

*[Brief syllabus and questions to be added here]*

# Chapter 6

# Topic 106: User Interfaces and Desktops

## 6.1 106.1 Install and configure X11

*[Brief syllabus and questions to be added here]*

## 6.2 106.2 Graphical Desktops

*[Brief syllabus and questions to be added here]*

## 6.3 106.3 Accessibility

*[Brief syllabus and questions to be added here]*

# Chapter 7

# Topic 107: Administrative Tasks

## 7.1 107.1 Manage user and group accounts and related system files

*[Brief syllabus and questions to be added here]*

## 7.2 107.2 Automate system administration tasks by scheduling jobs

*[Brief syllabus and questions to be added here]*

## 7.3 107.3 Localisation and internationalisation

*[Brief syllabus and questions to be added here]*

# Chapter 8

# Topic 108: Essential System Services

## 8.1 108.1 Maintain system time

*[Brief syllabus and questions to be added here]*

## 8.2 108.2 System logging

*[Brief syllabus and questions to be added here]*

## 8.3 108.3 Mail Transfer Agent (MTA) basics

*[Brief syllabus and questions to be added here]*

## 8.4 108.4 Manage printers and printing

*[Brief syllabus and questions to be added here]*

# Chapter 9

# Topic 109: Networking Fundamentals

## 9.1 109.1 Fundamentals of internet protocols

*[Brief syllabus and questions to be added here]*

## 9.2 109.2 Persistent network configuration

*[Brief syllabus and questions to be added here]*

## 9.3 109.3 Basic network troubleshooting

*[Brief syllabus and questions to be added here]*

## 9.4 109.4 Configure client side DNS

*[Brief syllabus and questions to be added here]*

# Chapter 10

# Topic 110: Security

## 10.1    110.1 Perform security administration tasks

*[Brief syllabus and questions to be added here]*

## 10.2    110.2 Setup host security

*[Brief syllabus and questions to be added here]*

## 10.3    110.3 Securing data with encryption

*[Brief syllabus and questions to be added here]*

# Answers

## Multiple-Choice Questions (101.1)

1. A

2. C

3. D

4. B

5. A

6. B

7. C

8. A

9. C

10. B

11. B

12. C

13. C

14. D

15. B

16. C

17. C

18. C

19. D

20. C

## Fill-in-the-Blank Questions (101.1)

1. BIOS

2. lsmod

3. driver

4. udev

5. /proc

6. BIOS

7. SCSI

8. modprobe

9. /etc/modprobe.d

10. lsusb