Learn Linux, 101: A roadmap for LPIC-1

Your guide to LPIC-1 exam-preparation tutorials on developerWorks

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Use this roadmap to find IBM developerWorks tutorials that help you learn and review basic Linux tasks. And if you're also pursuing professional certification as a Linux system administrator, these tutorials can help you study for the Linux Professional Institute's LPIC-1: Linux Server Professional Certification exams 101 and exam 102. This roadmap is organized according to the 43 objectives in the 101 and 102 exams, which you are required to pass for LPIC-1 certification.

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About this series

This series of tutorials helps you learn Linux system administration tasks. The topics mirror those of the Linux Professional Institute's LPIC-1: Linux Server Professional Certification exams. You can use the tutorials to prepare for certification, or you can use them to learn about Linux.

There are two exams for LPIC-1 certification: exam 101 and exam 102, and you must pass both to attain LPIC-1 certification. Each exam has several topics, and each topic has several objectives. This series of tutorials covers one objective per tutorial.

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The material in these tutorials corresponds to version 4.0 of the objectives of the LPIC-1 exams as updated April 15th, 2015 for LPIC-1 exam 101 and LPIC-1 exam 102. You can always refer to the objectives for the definitive requirements.

This roadmap is in progress; as tutorials are updated or completed, they will be added to the roadmap. While the older version 3 level content is being updated, the following topics that are still

at version 3 level are flagged. You can find a summary of the objective changes from version 3 to version 4 at LPIC1 Summary Version 3 To 4.

Note: New material will be added over the coming months as it becomes available. Build your own feed or check back here for updates.

Exam 101

Exam 101 - Topic 101: System architecture

developerWorks tutorial	LPI exam objective summary
Coming soon	**101.1 Determine and configure hardware settings** Determine and configure fundamental system hardware. This task covers integrated and external peripherals, coldplug and hotplug devices, and different kinds of mass storage devices. Tools related to devices, including USB devices, setting IDs, especially for booting, and low-level facilities such as sysfs, udev, and dbus are also covered. Weight 2
Learn Linux, 101: Boot the system Version 3	**101.2 Boot the system** Guide the system through the booting process. Tasks include giving common boot loader commands and kernel options at boot time, knowing the boot sequence from BIOS to boot completion, understanding the traditional SysVinit initialization alternatives and newer alternatives, and checking boot events in the log files. Weight 3
Learn Linux, 101: Runlevels, shutdown, and reboot Version 3	**101.3 Change runlevels and shut down or reboot system** Manage the runlevel of the system. Tasks include changing to single-user mode, shutting down or rebooting the system, setting the default runlevel, switching between runlevels, alerting users, and properly terminating process. Weight 3

Exam 101 - Topic 102: Linux installation and package management

developerWorks tutorial	LPI exam objective summary
Learn Linux, 101: Hard disk layout Version 4	**102.1 Design hard disk layout** Design a disk partitioning scheme for a Linux system. Tasks include allocating filesystems and swap space to separate partitions or disks, tailoring the design to the intended use of the system, and ensuring that the boot partition is acceptable for the hardware architecture. Weight 2
Learn Linux, 101: Install a boot manager Version 4	**102.2 Install a boot manager** Select, install, and configure a boot manager. Tasks include providing alternative boot locations and backup boot options, installing and configuring a boot loader such as GRUB or GRUB 2, and interacting with the boot loader. Weight 2
Learn Linux, 101: Manage shared libraries Version 4	**102.3 Manage shared libraries** Determine the shared libraries that executable programs depend on, and install them when necessary. Tasks include identifying shared libraries, knowing the typical locations of system libraries, and loading shared libraries. Weight 1
Learn Linux, 101: Debian package management Version 4	**102.4 Use Debian package management** Perform package management using the Debian package tools. Tasks include installing, upgrading, and removing Debian binary packages, finding packages containing specific files or libraries, and obtaining package information like version, content, dependencies, package integrity, and installation status. Weight 3
Learn Linux, 101: RPM and YUM package management Version 3	**102.5 Use RPM and YUM package management** Perform package management using RPM and YUM tools. Tasks include installing, reinstalling, upgrading, and removing packages using RPM and YUM; obtaining information on RPM

	packages such as version, status, dependencies, integrity, and signatures; and determining what files a package provides, and finding which package a specific file comes from. Weight 3

Exam 101 - Topic 103: GNU and UNIX commands

developerWorks tutorial	LPI exam objective summary
Learn Linux, 101: The Linux command line	**103.1 Work on the command line** Interact with shells and commands using the command line. This task includes typing valid commands and command sequences; defining, referencing and exporting environment variables; using command history and editing facilities; invoking commands in the path and outside the path; and using man pages to find out about commands. Weight 4
Learn Linux, 101: Text streams and filters	**103.2 Process text streams using filters** Apply filters to text streams. This task includes sending text files and output streams through text utility filters to modify the output, using standard UNIX commands found in the GNU textutils package. Weight 3
Learn Linux, 101: File and directory management	**103.3 Perform basic file and directory management** Use the basic UNIX commands to copy, move, and remove files and directories. Tasks include advanced file management operations such as copying multiple files recursively, removing directories recursively, using wildcard patterns, finding files and acting on them based on type size or time, and using tar, cpio, and dd commands. Weight 4
Learn Linux, 101: Streams, pipes, and redirects Version 3	**103.4 Use streams, pipes, and redirects** Redirect streams and connect them to efficiently process textual data. Tasks include redirecting standard input, standard output, and standard error; piping the output of one command to the input of another command; using the output of one command as arguments to another command; and sending output to both stdout and a file. Weight 4
Learn Linux, 101: Create, monitor, and kill processes Version 3	**103.5 Create, monitor, and kill processes** Manage processes. This task includes knowing how to run jobs in the foreground and background, bringing a job from the background to the foreground and vice versa, starting a process that will run without being connected to a terminal, and signaling a program to continue running after logout. Tasks also include monitoring active processes, selecting and sorting processes for display, sending signals to processes, and killing processes. Weight 4
Learn Linux, 101: Process execution priorities Version 3	**103.6 Modify process execution priorities** Manage process execution priorities. Tasks include determining the default priority of jobs, running a program with higher or lower priority, determining the priority of a process, and changing the priority of a running process. Weight 2
Learn Linux, 101: Search text files using regular expressions Version 3	**103.7 Search text files using regular expressions** Manipulate files and text data using regular expressions. Tasks include creating simple regular expressions that contain several notational elements and use regular expression tools to perform searches through a filesystem or file content. Weight 2
Learn Linux, 101: File editing with vi Version 3	**103.8 Perform basic file editing operations using vi** Edit text files using vi. Tasks include vi navigation; understanding basic vi nodes; and inserting, editing, deleting, copying, and finding text. Weight 3

Exam 101 - Topic 104: Devices, Linux filesystems, Filesystem Hierarchy Standard

developerWorks tutorial	LPI exam objective summary

Learn Linux, 101: Create partitions and filesystems Version 3	**104.1 Create partitions and filesystems** Configure disk partitions and create filesystems or swap space on media such as hard disks, and design a disk partitioning scheme for a Linux system. Tasks include understanding the different types of common Linux filesystems and allocating filesystems and swap space to separate partitions or disks. Weight 2 04 Dec 2012 - *This tutorial updated to include material for the LPI Exam 101: Objective Changes as of July 2, 2012.*
Learn Linux, 101: Maintain the integrity of filesystems Version 3	**104.2 Maintain the integrity of filesystems** Maintain a standard filesystem or journaling filesystem. Tasks include verifying the integrity of filesystems, monitoring free space and inodes, and repairing simple filesystem problems. Weight 2
Learn Linux, 101: Control mounting and unmounting of filesystems Version 3	**104.3 Control mounting and unmounting of filesystems** Configure the mounting of a filesystem. Tasks include manually mounting and unmounting filesystems, configuring filesystem mounting on bootup, and configuring user-mountable removable filesystems. Weight 3
Learn Linux, 101: Manage disk quotas Version 3	**104.4 Manage disk quotas** Manage disk quotas for users. Tasks include setting up a disk quota for a filesystem and editing, checking, and generating user quota reports. Weight 1
Learn Linux, 101: Manage file permissions and ownership Version 3	**104.5 Manage file permissions and ownership** Control file access through the proper use of permissions and ownerships. Tasks include managing access permissions on regular and special files as well as directories; using access modes such as suid, sgid, and the sticky bit to maintain security; learning how to change the file creation mask; and using the group field to grant file access to group members. Weight 3
Learn Linux, 101: Create and change hard and symbolic links Version 3	**104.6 Create and change hard and symbolic links** Create and manage hard and symbolic links to a file. Tasks include creating links, identifying hard and or soft links, understanding the difference between copying and linking files, and using links to support system administration tasks. Weight 2
Learn Linux, 101: Find and place system files Version 3	**104.7 Find system files and place files in the correct location** Understand the Filesystem Hierarchy Standard (FHS), including typical file locations and directory classifications. Tasks include understanding the correct locations of files under the FHS, finding files and commands on a Linux system, and learning the location and purpose of important file and directories as defined in the FHS. Weight 2

Exam 102

Exam 102 - Topic 105: Shells, scripting, and data management

developerWorks tutorial	LPI exam objective summary
Coming soon	**105.1 Shells, scripting, and data management** Customize and use the shell environment. Tasks include customizing shell environments to meet user needs; modifying global and user profiles; setting environment variables, such as PATH, at login or when spawning a new shell; writing Bash functions for frequently used sequences of commands; maintaining skeleton directories for new user accounts; and setting command search paths with the proper directories. Weight 4
Coming soon	**105.2 Customize or write simple scripts** Customize existing Bash scripts, or write simple new ones. Tasks include using standard shell loop and test syntax; using command substitution; testing return values for success or failure; conditionally mailing the superuser, selecting the correct script interpreter through the shebang (#!) line; and managing the location, ownership, execution, and suid-rights of scripts. Weight 4
Coming soon	**105.3 SQL data management**

	Query databases and manipulate data using basic SQL commands, including joins or subselects. Tasks include using basic SQL commands and performing basic data manipulation. Weight 2

Exam 102 - Topic 106: User interfaces and desktops

developerWorks tutorial	LPI exam objective summary
Coming soon	**106.1 Install and configure X11** Install and configure X11. Tasks include verifying that your video card and monitor are supported by an X server, understanding the X font server, and understanding the X Window configuration file. Weight 2
Coming soon	**106.2 Set up a display manager** Configure the mounting of a filesystem. Tasks include setting up the X Display Manager (XDM), Gnome Display Manager (GDM), and KDE Display Manager (KDM); customizing the greeting and color depth; and configuring display managers for use by X-stations. Weight 2
Coming soon	**106.3 Accessibility** Demonstrate knowledge and awareness of accessibility technologies. Tasks include understanding keyboard accessibility settings, visual settings and themes, and assistive technology (ATs). Weight 1

Exam 102 - Topic 107: Administrative tasks

developerWorks tutorial	LPI exam objective summary
Coming soon	**107.1 Manage user and group accounts and related system files** Add, remove, suspend, and change user accounts. Tasks include adding, modifying, and removing users and groups; managing user and group information in password and group databases; and creating and managing special-purpose and limited accounts. Weight 5
Coming soon	**107.2 Automate system administration tasks by scheduling jobs** Maintain a standard filesystem or journaling filesystem. Tasks include using the cron or anacron facilities to run jobs at regular intervals and the `at` command to run jobs at a specific time. Weight 4
Coming soon	**107.3 Localization and internationalization** Localize a system in a language other than English and understand why `LANG=C` is useful when scripting. Tasks include understanding locale and timezone settings. Weight 3

Exam 102 - Topic 108: Essential system services

developerWorks tutorial	LPI exam objective summary
Coming soon	**108.1 Maintain system time** Maintain the system time and synchronize the clock via NTP. Tasks include setting the system date and time, setting the hardware clock to the correct time in UTC, configuring the timezone, configuring NTP, and understanding the pool.ntp.org service. Weight 3
Coming soon	**108.2 System logging** Configure the syslog daemon and the logging daemon to send log output to a central log server or accept log output as a central log server. Tasks include understanding syslog configuration files, the syslog facility, and standard facilities, priorities, and actions. Weight 2
Coming soon	**108.3 Mail Transfer Agent (MTA) basics** Become familiar with commonly available MTA programs and perform basic forward and alias configuration on a client host. Tasks include creating email aliases, configuring email forwarding,

	and learning about commonly available MTA programs such as postfix, sendmail, qmail, and exim. Weight 3
Coming soon	**108.4 Manage printers and printing** Manage print queues and user print jobs using CUPS and the LPD compatibility interface. Tasks include configuring CUPS for local and remote printers, managing user print queues, troubleshooting general printing problems, and adding and removing jobs from configured printer queues. Weight 2

Exam 102 - Topic 109: Networking fundamentals

developerWorks tutorial	LPI exam objective summary
Coming soon	**109.1 Fundamentals of internet protocols** Understand TCP/IP network fundamentals. Tasks include learning about network masks; knowing the differences between private and public dotted decimal IP addresses; setting a default route; understanding common TCP and UDP ports (20, 21, 22, 23, 25, 53, 80, 110, 119, 139, 143, 161, 443, 465, 993, and 995); understanding the differences and major features of UDP, TCP, and ICMP; and knowing the major differences between IPv4 and IPv6. Weight 4
Coming soon	**109.2 Basic network configuration** View, change, and verify configuration settings on client hosts. Tasks include manually and automatically configuring network interfaces and configuring TCP/IP hosts. Weight 4
Coming soon	**109.3 Basic network troubleshooting** Troubleshoot networking issues on client hosts. Tasks include manually and automatically configuring network interfaces and routing tables to add, start, stop, restart, delete, or reconfigure network interfaces; changing, viewing, or configuring the routing table; correcting an improperly set default route manually; and debugging problems associated with the network configuration. Weight 4
Coming soon	**109.4 Configure client side DNS** Configure DNS on a client host. Tasks include using DNS on the local system and modifying the order in which name resolution is done. Weight 2

Exam 102 - Topic 110: Security

developerWorks tutorial	LPI exam objective summary
Coming soon	**110.1 Perform security administration tasks** Review system configuration to ensure host security in accordance with local security policies. Tasks include auditing a system to find files with the suid/sgid bit set; setting or changing user passwords and password aging information; using nmap and netstat to discover open ports on a system; setting limits on user logins, processes, and memory usage; and basic sudo configuration and usage. Weight 3
Coming soon	**110.2 Setup host security** Set up a basic level of host security. Tasks include learning about shadow passwords and how they work, stopping network services not in use, and learning about TCP wrappers. Weight 3
Coming soon	**110.3 Securing data with encryption** Use public key techniques to secure data and communication. Tasks include configuring and using OpenSSH 2 clients, learning the role of OpenSSH 2 server host keys, configuring and using GnuPG, and learning about SSH port tunnels, including X11 tunnels. Weight 3

Resources

- At the Linux Professional Institute website, find detailed objectives, task lists, and sample questions for the certifications. In particular, see:
  - The LPIC-1: Linux Server Professional Certification program details
  - LPIC-1 exam 101 objectives
  - LPIC-1 exam 102 objectives

  Always refer to the Linux Professional Institute website for the latest objectives.
- Stay current with developerWorks technical events and webcasts focused on a variety of IBM products and IT industry topics.
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About the author

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Ian Shields is a freelance Linux writer. He retired from IBM at the Research Triangle Park, NC. Ian joined IBM in Canberra, Australia, as a systems engineer in 1973, and has worked in Montreal, Canada, and RTP, NC in both systems engineering and software development. He has been using, developing on, and writing about Linux since the late 1990s. His undergraduate degree is in pure mathematics and philosophy from the Australian National University. He has an M.S. and Ph.D. in computer science from North Carolina State University. He enjoys orienteering and likes to travel.