# CompTIA Linux+ System Administration Bootcamp

Course Summary

**Length:** 5 Days (10 hrs per day) **Prerequisite**: No prerequisites

**Recommendation Statement:**
There are no prerequisites for this class other than basic computer skills.

**Course Description:**
This course teaches the intro to intermediate level topics required to administer a Red Hat ® Enterprise Linux 7 system. Topics in this course also apply to the CentOS and Debian distributions. Students will learn essential Linux commands, shell features, and how to install, configure and administer a Linux enterprise system.

This course prepares the student for the CompTIA Linux+ Certification LX0-103 & LX0-104 and the Linux Professional Institute LPIC-1 101 & 102 certification exams.

**The following topics are covered in this course:**

LX0-103 & LPIC-1 101 Topics
- Introduction to the Linux OS
- The command line vs. the desktop environments
- Understand Bash shell features and the CLI
- Use the Linux commands from the CLI
- Process text streams and use filters
- Perform file management
- Use streams, pipes and redirects
- System Architecture
- System bootup and shutdown
- Change run levels, boot targets
- Create, manage, monitor and kill processes
- Manage process priorities
- Search text files using regular expressions
- Edit files using the command line editors
- Determine and configure fundamental system hardware
- Install and Update the OS
- Linux installation and package management
- Install a boot manager
- Manage share libraries
- Use Debian, RPM and YUM package management
- Understand Devices, file systems and filesystem hierarchy standards
- Mount and unmount file systems
- Manage disk quotas
- Manage file permissions and ownership
- Understand symbolic and hard links
- Find files using Linux command line utilities
- Configure and Administer the network and firewall

LX0-104 & LPIC-1 102 Topics
- Customize and use the bash shell environment
- Customize and write simple shell scripts
- SQL Data management
- Install and configure X11
- Setup a display manager
- Understand accessibility settings
- Manage users and groups, understand related system configuration files
- Automate system administration tasks by scheduling jobs
- Localization and internationalization
- Maintain the system date and time
- System logging
- Mail transfer agent (MTA) basics
- Manage printers and printing
- Understand internet protocols
- Network configuration and troubleshooting
- Configure client-side DNS
- Perform security administration tasks
- Setup host security
- Secure data with encryption

# CompTIA Linux+ System Administration Bootcamp

Detailed Course Outline

## LX0-103 & LPIC-1 101 Topics

1) **GNU and Unix Commands**
   a) Use bash shell commands and command strings to perform basic tasks on the command line
   b) Modify the bash shell environment: define, display environment variables.
   c) Understand local vs exported shell environment variables
   d) Use and edit command history
   e) Use the command help facility
2) **Process text streams using filters**
   a) Use filters on text files and output streams to modify the output
3) **Perform basic file management**
   a) Copy, move and delete files and directories
   b) Copy multiple files and directories recursively
   c) Remove files and directories recursively
   d) Use wildcard specifications
   e) Use the find utility to locate and perform actions on files based on type, size, or time
   f) Use of tar, cpio and dd
4) **Use streams, pipes and redirects**
   a) Redirect standard input, standard output and standard error
   b) Pipe the output of one command to the input of another command
   c) Use the output of one command and as an argument to another command
   d) Redirect output to both stdout and a file
5) **Create, monitor and kill processes**
   a) Run jobs in the foreground and background using at and bg
   b) Signal a program to continue running after logout
   c) Monitor active processes
   d) Select and sort processes for display
   e) Send signals to processes
6) **Modify process execution priorities**
   a) Understand the default priority of a job; change the priority of a process
   b) Run a program with higher or lower priority than the default
7) **Search text files using regular expressions**
   a) Use regular expression tools to perform searches through a filesystem or file content
8) **Perform basic file editing operations using vi**
   a) Navigate a document using vi, vim and nano
   b) Use basic vi modes
   c) Insert, edit, delete, copy and find text
9) **Devices, Linux Filesystems, Filesystem Hierarchy Standard**
   a) Manage MBR partition tables
   b) Use various mkfs commands to create various filesystems such as ext2/ext3/ext4/XFS/VFAT
   c) Compare conventional filesystem with ReiserFS and Btrfs
   d) Basic knowledge of fdisk, gdisk and parted with GPT
10) **Manage file permissions and ownership**
   a) Manage access permissions on regular and special files as well as directories
   b) Understand access modes such as suid, sgid and the sticky bit to maintain security
   c) Understand why and how to change the file creation mask
   d) Use the group field to grant file access to group members
11) **Create and change hard and symbolic links**
   a) Create links
   b) Identify hard and/or soft links
   c) Copy versus link on files
   d) Use links to facilitate system administration tasks
12) **Find system files and place files in the correct location**
   a) Understand the correct locations of files under the File System Hierarchy Standard (FHS)
   b) Find files and commands on a Linux system
   c) Know the location and purpose of important file and directories as defined in the FHS
13) **Understand the Boot Process**
   a) Use commands to the boot loader and options to the kernel at boot time
   b) Understand the boot sequence from BIOS to boot completion
   c) Understanding of SysVinit and systemd
   d) Awareness of Upstart

e) Display boot events and understand location of system related log files

**14) Determine and configure hardware settings**
a) Use command line utilities to list various hardware information (e.g. lsusb, lspci, etc.)
b) Tools and utilities to manipulate USB devices
c) Understand sysfs, udev, dbus

**15) Manage runlevels / boot targets and shutdown or reboot system**
a) Set the default runlevel or boot target
b) Switch a running system between runlevels / boot targets including single user mode
c) Shutdown and reboot from the command line
d) Alert users before switching runlevels or other major system events
e) Understand methods used to kill and terminate processes

**16) Administer File Systems**
a) Understand the types of file systems and file system structures
b) Create file systems
c) Mount / Unmount file systems automatically and manually
d) Understand and Manage XFS file systems

**17) Manage the file system table (fstab)**
a) Knowledge of basic features of Logical Volume Manager (LVM)
b) Logical Volume Management
c) Implementing LVM
d) Creating Logical Volumes

**18) Maintain the integrity of filesystems**
a) Verify the integrity of filesystems
b) Monitor free space and inodes
c) Repair filesystems

**19) Mount and unmount filesystems**
a) Manually mount and unmount filesystems
b) Configure filesystem mounting on bootup
c) Configure user mountable removable filesystems

**20) Manage disk quotas**
a) Set up a disk quota for a filesystem
b) Edit, check and generate user quota reports

**21) Linux Installation and Package Management**
a) Allocate filesystems and swap space to separate partitions or disks
b) Tailor the design to the intended use of the system
c) Ensure the /boot partition conforms to the hardware architecture requirements for booting

**22) Install a boot manager**
a) Providing alternative boot locations and backup boot options
b) Install and configure a boot loader such as GRUB Legacy
c) Perform basic configuration changes for GRUB 2
d) Interact with the boot loader

**23) Manage shared libraries**
a) Identify shared libraries
b) Identify the typical locations of system libraries
c) Load shared libraries

**24) Use Debian package management**
a) Install, upgrade and uninstall Debian binary packages
b) Find packages containing specific files or libraries which may or may not be installed
c) Obtain package information like version, content, dependencies, package integrity and installation status (whether or not the package is installed)

**25) Use RPM and YUM package management**
a) Install, re-install, upgrade and remove packages using RPM and YUM
b) Obtain information on RPM packages such as version, status, dependencies, integrity and signatures
c) Determine what files a package provides, as well as find which package a specific file comes from

LX0-104 & LPIC-1 102 Topics

**26) Customize and use the bash shell environment**
a) Set environment variables (e.g. PATH) at login or when starting a new shell
b) Create bash functions
c) Maintain skeleton directories and template files for new user accounts
d) Set the command search path for the bash shell

**27) Customize and write simple shell scripts**
a) Use standard sh syntax (for, while, test, if, read, seq, exec)
b) Use command substitution
c) Test return values for success or failure or other information provided by a command
d) Perform conditional mailing to the superuser
e) Correctly select the script interpreter through the shebang (#!) line

f) Manage the location, ownership, execution and suid-rights of scripts

28) **SQL Data management**
   a) Use of basic SQL commands
   b) Perform basic data manipulation

**29) Install and configure X11**
   a) Verify support of the X11
   b) Understand the configuration of the X font server
   c) Understand the X Window configuration files

**30) Setup a display manager**
   a) Configure LightDM
   b) Turn the display manager on or off
   c) Change the display manager greeting
   d) Understand XDM, KDM and GDM

**31) Understand accessibility settings**
   a) Gain knowledge of keyboard accessibility settings (AccessX), visual settings and themes and assistive technology (ATs)

**32) Manage users and groups, understand related system configuration files**
   a) Add, modify, manage and remove users and groups
   b) Understand where user and group information is stored locally and when LDAP is employed
   c) Manage user and group information in the password and group configuration files
   d) Create and manage special purpose and limited accounts

**33) Automate system administration tasks by scheduling jobs**
   a) Manage scheduled tasks with cron and at jobs
   b) Configure user permissions to use cron and at services
   c) Configure anacron and understand configuration files

**34) Localization and internationalization**
   a) Configure the system locale and timezone; understand the configuration files and environment variables

**35) Maintain the system date and time**
   a) Set the system date and time including setting the hardware clock to the correct time in UTC
   b) Configure the correct timezone
   c) Configure NTP
   d) Understand the pool.ntp.org service
   e) Understand the ntpq command

**36) System logging**
   a) Configure the syslog daemon and the logging of messages by facility, priority and action
   b) Configure logrotate to manage system files
   c) Understand rsyslog and syslog-ng
   d) Understand where system log files are located
   e) Configure system logs- local and remote

**37) Mail transfer agent (MTA) basics**
   a) Create e-mail aliases
   b) Configure e-mail forwarding
   c) Understand the Linux mail transfer agent programs (postfix, sendmail, qmail, exim) (no configuration)

**38) Manage printers and printing**
   a) Configure CUPS for local and remote printers
   b) Manage user print queues
   c) Troubleshoot general printing problems
   d) Manage print jobs and printer queues

**39) Understand internet protocols**
   a) Understand network masks and CIDR notation
   b) Understand private and public “dotted quad” IP addresses
   c) Understand common TCP and UDP ports and services (ie. 20, 21, 22, 23, 25, 53, 80, 110, 123, 139, 143, 161, 162, 389, 443, 465, 514, 636, 993, 995)
   d) Understand major features of UDP, TCP and ICMP
   e) Understand the differences between IPv4 and IPv6

**40) Network configuration and troubleshooting**
   a) Configure network interfaces manually and automatically
   b) Understand the location and structure of supporting network configuration files
   c) Configure host settings for TCP/IP
   d) Set a default route
   e) Manually and automatically configure routing tables
   f) Understand how to add, start, stop, restart, reconfigure and delete a network interface
   g) Change, view, or configure the routing table; identify and correct an improperly set default route
   h) Debug problems associated with the network configuration

**41) Configure client-side DNS**
   a) Query remote DNS servers
   b) Configure local name resolution and use remote DNS servers
   c) Modify the order in which name resolution is done

**42) Perform security administration tasks**

a) Audit a system to find files that have the suid/sgid bit set
b) Manage user passwords and password aging information
c) Use nmap and netstat to discover open ports on a system
d) Set limits on user logins, processes and memory usage
e) Display logged in users- current and past
f) Understand and configure sudo for delegated privileges

**43) Setup host security**

a) Understand shadow passwords
b) Turn off unnecessary network services
c) Understand TCP wrappers; where and when they are used

**44) Secure data with encryption**

a) Configure OpenSSH 2 for remote connections
b) Understand OpenSSH 2 server host keys
c) Configure GnuPG configuration, usage and revocation
d) Understand SSH port tunnels (including X11 tunnels)

45) **Setup a Virtual Lab Environment using VirtualBox**

a) Setup a virtual lab environment to practice on after class is complete. Because Linux is a continuous learning experience, you'll be able to use this virtual lab to continually improve your skills.

**Lab Exercises**

Hands on lab exercises will be provided at the completion of each section