Certification Preparation Guide

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TRAINING

Contents

Welcome to the Linux Foundation Certification Preparation Guide! This guide is neither exhaustive, nor is it to be considered a guarantee that if you use all the resources within, you will pass your Linux Foundation Certification Exam.

Rather, this guide is intended to give you an idea of what the exam will cover, and point out some resources that can help you strengthen your knowledge and experience in those areas. We hope you find this guide to be helpful in your pursuit of a Linux Foundation Certification.

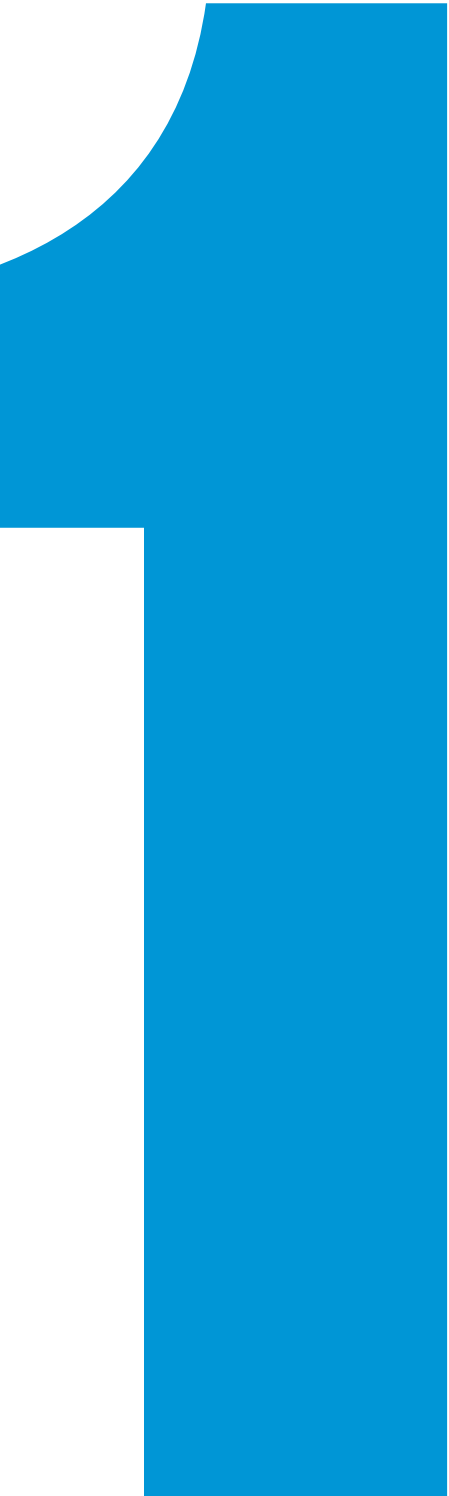# About Linux Foundation Certifications

The demand for Linux has never been greater, and there are many jobs available to qualified applicants. Linux Certifications play an important role in helping employers understand which applicants are qualified, which is why certification holders are often given preference in the hiring process. It has also been shown that people with certifications make more money than their uncertified counterparts.

The fact is:

- Today's Linux job market is global

- The best Linux certifications reflect what you can actually do at the command line

- More and more employers are using a variety of Linux distros as opposed to just one

- That's why Linux Certifications are:

    - Online anytime, anywhere – Now you don't have to travel to a testing center to get a top Linux certification

    - Performance-based – You can show off the command line skills you use on a daily basis – no trick questions, no multiple choice.

    - Distro-flexible – You can take the certification exam in CentOS, openSUSE or Ubuntu. Linux Foundation Certifications demonstrate that you have the Linux skills and knowledge no matter what distro you choose to take the exam in.

ABOUT THIS GUIDE

The purpose of this guide is to help candidates feel confident that they are ready to take a Linux Foundation certification exam. It includes information about the actual process of taking the exam as well as some resources to help you prepare to take the exam. This guide will be updated regularly, so if you have comments, suggestions, or other feedback, we'd love to hear about it. Send your feedback to certificationsupport@linuxfoundation.org.

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Preparing for the
Exam

Section 1 - Preparing for the exam

I - Domains and competencies

The following two checklists are for the Linux Foundation Certified System Administrator and Engineer exams, respectively. They'll show you what you should know before taking the exam and give you a guide to study from.

LINUX FOUNDATION CERTIFIED SYSTEM ADMINISTRATOR

LINUX FOUNDATION CERTIFIED ENGINEER

LINUX FOUNDATION CERTIFIED SYSTEM ADMINISTRATOR
DOMAINS & COMPETENCIES

Please note that this is a subset of the full list of Domains and Competencies for the LFCS Exam. This subset represents topics most likely to appear given the delivery technology, performance-based questions and time constraints of the exam. For the full list, go to https://training.linuxfoundation.org/images/pdfs/LFCS_Domains_Competencies_V2.16.pdf.

Essential Commands - 25%

- ☐ Log into graphical & text mode consoles
- ☐ Search for files
- ☐ Evaluate & compare the basic file system features & options
- ☐ Compare, create & edit text files
- ☐ Compare binary files
- ☐ Use input-output redirection (e.g. >, >>, |, 2>)
- ☐ Analyze text using basic regular expressions
- ☐ Archive, backup, compress, unpack, & uncompress files
- ☐ Create, delete, copy, & move files & directories
- ☐ Create hard & soft links
- ☐ List, set, & change standard file permissions
- ☐ Read & use system documentation
- ☐ Manage access to the root account

User and Group Management - 15%

- ☐ Create, delete, & modify local user accounts
- ☐ Create, delete, & modify local groups & group memberships
- ☐ Manage system-wide environment profiles
- ☐ Manage template user environment
- ☐ Configure user resource limits
- ☐ Manage user processes
- ☐ Configure PAM

Operation of Running Systems - 20%

- ☐ Boot, reboot, & shut down a system safely
- ☐ Boot systems into different runlevels manually
- ☐ Install, configure & troubleshoot the bootloader
- ☐ Change the priority of a process
- ☐ Identify resource utilization by process
- ☐ Locate & analyze system log files
- ☐ Schedule tasks to run at a set date & time
- ☐ Verify completion of scheduled jobs
- ☐ Update software to provide required functionality & security
- ☐ Verify the integrity & availability of resources
- ☐ Verify the integrity & availability of key processes
- ☐ Change kernel runtime parameters, persistent & non-persistent
- ☐ Use scripting to automate system maintenance tasks
- ☐ Manage the startup process & services
- ☐ List & identify SELinux/AppArmor file & process contexts
- ☐ Configure & modify SELinux/AppArmor policies
- ☐ Install software from source

LINUX FOUNDATION CERTIFIED SYSTEM ADMINISTRATOR
DOMAINS & COMPETENCIES, continued...

Networking - 15%

- ❑ Configure networking & hostname resolution statically or dynamically
- ❑ Configure network services to start automatically at boot
- ❑ Implement packet filtering
- ❑ Configure firewall settings
- ❑ Start, stop, & check the status of network services
- ❑ Statically route IP traffic
- ❑ Dynamically route IP traffic
- ❑ Synchronize time using other network peers

Service Configuration - 10%

- ❑ Configure a basic DNS server
- ❑ Maintain a DNS zone
- ❑ Configure an FTP server
- ❑ Configure anonymous-only download on FTP servers
- ❑ Provide/configure network shares via NFS
- ❑ Provide/configure network shares via CIFS
- ❑ Configure email aliases
- ❑ Configure SSH servers & clients
- ❑ Configure SSH-based remote access using public/private key pairs
- ❑ Restrict access to the HTTP proxy server
- ❑ Configure an IMAP & IMAPS service
- ❑ Query & modify the behavior of system services at various run levels
- ❑ Configure an HTTP server
- ❑ Configure HTTP server log files
- ❑ Restrict access to a web page
- ❑ Diagnose routine SELinux/AppArmor policy violations
- ❑ Configure database server

Virtualization - 5%

- ❑ Configure a hypervisor to host virtual guests
- ❑ Access a VM console
- ❑ Configure systems to launch virtual machines at boot
- ❑ Evaluate memory usage of virtual machines
- ❑ Resize RAM or storage of VMs

Storage Management - 10%

- ❑ List, create, delete, & modify storage partitions
- ❑ Create, modify & delete Logical Volumes
- ❑ Extend existing Logical Volumes & filesystems
- ❑ Create & configure encrypted partitions
- ❑ Configure systems to mount file systems at or during boot
- ❑ Configure & manage swap space
- ❑ Add new partitions, & logical volumes
- ❑ Assemble partitions as RAID devices
- ❑ Configure systems to mount standard, encrypted, & network file systems on demand
- ❑ Create & manage filesystem Access Control Lists (ACLs)
- ❑ Diagnose & correct file permission problems
- ❑ Setup user & group disk quotas for filesystems

LINUX FOUNDATION CERTIFIED ENGINEER
DOMAINS & COMPETENCIES

The LFCE Exam builds on the Domains and Competencies from the LFCS Exam. The list of Domains and Competencies below should be considered in combination with the Domains and Competencies listed for the LFCS Exam.

Network administration

- ☐ Configure network services to start automatically at boot
- ☐ Implement packet filtering
- ☐ Monitor network performance
- ☐ Produce and deliver reports on system use, outages and user requests
- ☐ Route IP traffic statically and dynamically
- ☐ Troubleshoot network issues

Network filesystems and file services

- ☐ Configure systems to mount standard, encrypted and network file systems on demand
- ☐ Create, mount and unmount standard Linux file systems
- ☐ Provide/configure network shares via NFS
- ☐ Transfer files securely via the network
- ☐ Update packages from the network, a repository or the local file system

Network security

- ☐ Configure Apache log files
- ☐ Configure the firewall with iptables
- ☐ Install and configure SSL with Apache
- ☐ Configuring SSH-based remote access using public/private key pairs

Remote access

- ☐ Configure the firewall with iptables

HTTP services

- ☐ Configure an http client to automatically use a proxy server
- ☐ Install and configure an Apache web server
- ☐ Install and configure the Squid proxy server
- ☐ Restrict access to a web page with Apache
- ☐ Restrict access to the Squid proxy server
- ☐ Setting up name-based virtual web hosts

Email services

- ☐ Configure email aliases
- ☐ Install and configure an IMAP and IMAPS service
- ☐ Install and configure an smtp service
- ☐ Restrict access to an smtp server

II - Free training resources

LFS101X INTRO TO LINUX COURSE

If you are new (or relatively new) to Linux, we suggest you enroll in the free, 100% online and self-paced 'Intro to Linux' course on edX. You do not need to pay for the Verified certificate (though you may choose to do so if you wish). Everybody's background and experience is different, so feel free to use as much or as little of the course as you need to increase your familiarity. There is no requirement for you to take the whole course or even to pass the final exam. It is there to make sure that you have the foundational knowledge that will help you, particularly for The Linux Foundation Certified System Administrator exam.

https://www.edx.org/course/linuxfoundationx/linuxfoundationx-lfs101x-introduction-1621

LINUX.COM NEW USER GUIDES

These new user guides, while focused on helping people install Linux for the first time, do provide some valuable tips and tricks, which are especially helpful when you're looking at a fresh install of Linux in the exam terminal.

http://www.linux.com/learn/new-user-guides

THE LINUX FOUNDATION YOUTUBE CHANNEL

The Linux Foundation YouTube channel is packed with resources, including keynotes and presentations from LinuxCon and other conferences, tutorials, and other informational videos about Linux in general. In particular, you'll want to take a look at the Linux Training playlist.

http://www.youtube.com/user/TheLinuxFoundation

LEARN LINUX GUIDES

The 'Learn Linux' section of Linux.com offers a vast array of resources to help you learn Linux, regardless of your current skill level. For basic questions, you can look in the Linux Tutorials section. For specific items, you can look through the online Linux Documentation, or for more advanced questions, you can get help in the Linux Answers section.

http://www.linux.com/learn

OPS SCHOOL

Ops School is a community-built course and reference guide for people interested in a career in systems administration. Not all of the articles are complete, but the vast majority are well-written and technically correct. They are organized by topic and difficulty, making it easy to find the subject you're interested in. A couple of lessons that you might find helpful are:

Text Editing 101 - http://www.opsschool.org/en/latest/text_editing_101.html

Unix Fundamentals 101 > File systems - http://www.opsschool.org/en/latest/filesystems_101.html

DISTRIBUTION-SPECIFIC MANUALS & GUIDES

Each of the exam-eligible distros has a vast body of helpful content and guides to help you with whatever issue you're currently struggling with. Once you've selected your exam distro, it would be a good idea to look up the individual items on the Domains and Competencies checklist for your distro, even if it's just to refresh your memory. The links below are for official resources created and blessed by the distro maintainers.

CentOS: http://wiki.centos.org/HowTos

openSUSE: http://doc.opensuse.org/

Ubuntu: https://help.ubuntu.com/community/CommunityHelpWiki

100 LINUX TUTORIAL VIDEOS

If you're more of a visual learner, check out the "100 Linux Tutorials" page on linux.com. There are now more than 100 videos on that page covering a wide array of topics and issues, many of which are related to the Exam Domains and Competencies.

http://video.linux.com/categories/100-linux-tutorials-campaign

FREE PREP RESOURCES FOR RED HAT, SUSE, ETC

Since all reputable Linux certifications (e.g. LPI, Red Hat, SUSE) have been developed by experts, you will likely find that free resources available as preparation for those exams will also be useful in preparing for the Linux Foundation exams.

III - Paid training resources

If you are interested in a more guided approach to test preparation, there are some additional paid options you may want to consider:

LFS201 - ESSENTIALS OF SYSTEM ADMINISTRATION

This self-paced, online course is designed to give you a fundamental understanding of skills and knowledge necessary to be a system administrator. In combination with the LFS101x Intro to Linux course listed under Free Training Resources above, it provides excellent preparation for the Linux Foundation Certified System Administrator Exam. You have 12 months to complete the course at your own pace.

The course is $499 when bundled with an LFCS Exam registration, or $399 for just the course alone.

http://training.linuxfoundation.org/essentials-of-system-administration

LFS301 - LINUX SYSTEM ADMINISTRATION

This 4-day course covers all the domains and competencies required for the LFCS exam. The course may be taken in a classroom or online (using screen sharing and a conference call line), so you'll be able to ask questions or get more clarification on specific items. You will also spend some quality time in hands-on learning and discovery throughout the course to aid your learning and retention.

The course is $2,500 and a complimentary registration for a Certification Exam is included in that price.

http://training.linuxfoundation.org/linux-courses/system-administration-training/linux-system-administration

LFS311 - ADVANCED LINUX SYSTEM ADMINISTRATION AND NETWORKING

This 4-day course covers all the domains and competencies required for the LFCE exam. The course may be taken in a classroom or online (using screen sharing and a conference call line), so you'll be able to ask questions or get more clarification on specific items. You will also spend some quality time in hands-on learning and discovery throughout the course, which aids your learning and retention.

The course is $2,500 and a complimentary registration for a Certification Exam is included in that price.

http://training.linuxfoundation.org/linux-courses/system-administration-training/linux-network-management

PLEASE NOTE THAT PAID TRAINING IS NOT REQUIRED TO PASS EITHER EXAM.

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Taking the Exam

Section 2 - Taking the exam

I - System Requirements

Linux Foundation Certification exams are proctored by a live person via webcam and you will answer all exam questions using a terminal in your web browser. You don't have to install anything extra, but there are a few hardware and software requirements that must be met in order to take the exam. Because your time to take the exam is limited to two hours, you want to make sure your equipment is ready and meets minimum requirements well in advance of taking the exam. You don't want to lose any precious exam time dealing with technical difficulties.

You can use this link to check your system compatibility at any time:
https://www.examslocal.com/ScheduleExam/Home/CompatibilityCheck

The system requirements include:

Chrome or Chromium browser - You must be running at least version 32 of Chrome or Chromium because the exam video feed relies on the WebRTC extension. (This is the same technology Google uses for Hangouts.)

A single functioning webcam - Please don't have more than one connected. To make sure that your webcam will be sufficient, try holding up your ID while viewing your webcam feed to ensure your placement and resolution are sufficient for the person viewing your feed to read your ID.

A functioning microphone - Please check to make sure it is working before you start your exam session.

Cookies enabled - You must enable cookies for third-party applications to take the exam. Don't worry, you can enable them when starting your exam and then disable and delete them as soon as you complete your exam.

Bandwidth - You can take your Linux Foundation Certification Exam when and where you want. However, it is incumbent upon you to ensure that you have a fast, stable Internet connection. We recommend turning off any bandwidth-intensive services (file sync and sharing apps like Dropbox, BitTorrent, etc.) and if you share your Internet connection with anyone else, asking them to avoid using bandwidth intensive services (like video streaming) while you're taking your exam. **Minimum recommended speeds: at least 500kb/s down and 256 kb/s up**

Ports - Make sure that **port 80** and **port 443** are open on your machine.

II - Your Physical Environment

You only have two hours to complete your Linux Foundation Certification Exam and the clock keeps running once you start, so you'll want to make sure that you take the exam somewhere distraction-free where you can focus 100%.

Here are some things to consider:
- Think about possible sources of distractions (kids, loud music, pets) and have a plan for minimizing them.

- Use the bathroom right before you start your exam.

- Turn off cell phones, instant messaging programs, notifications, email, etc.

- Take off your Google Glass, Samsung Gear, Apple Watch, or any other electronic device. They're not allowed.

- See 'Testing Location Requirements' in the Candidate Handbook for more detailed info: http://training.linuxfoundation.org/go/candidate_handbook

III - Understanding the Exam Interface

Because the exam is delivered 100% through the browser, it's important for you to take a few minutes to familiarize yourself with the experience.
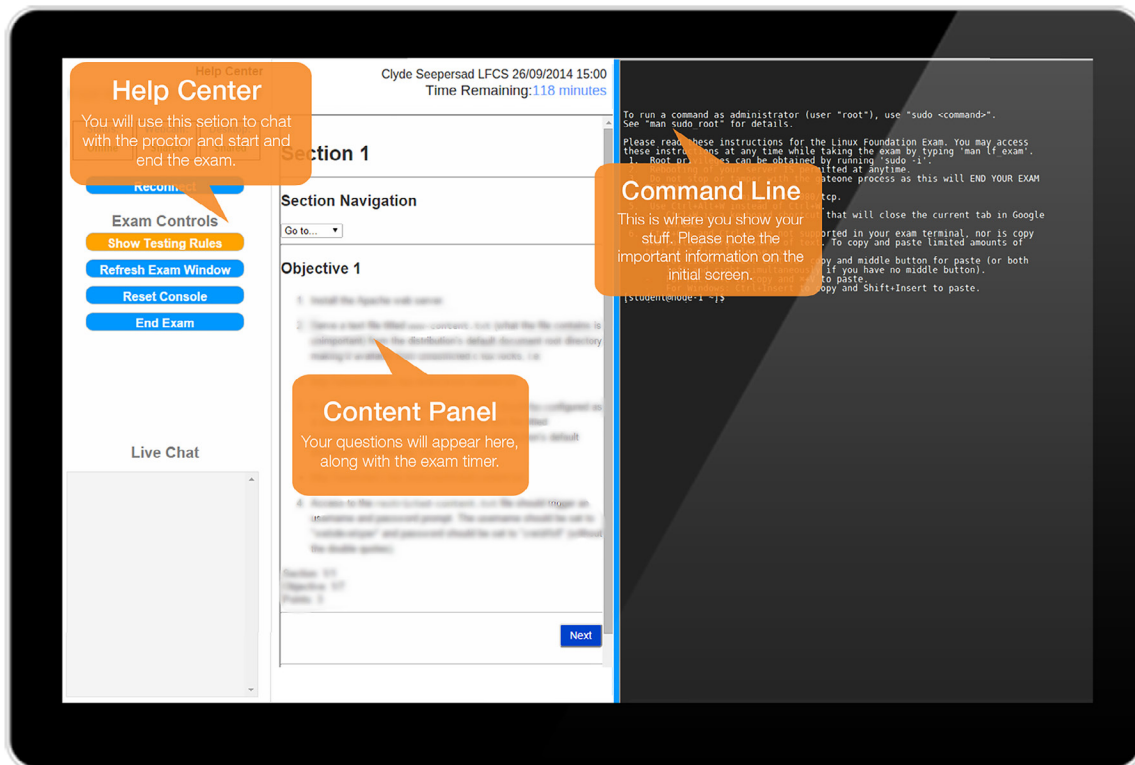
QUESTION AND SECTION NAVIGATION

Objectives can only be navigated linearly using the left and right arrows at bottom, but don't feel compelled to do questions in the order presented. You can skip ahead and return to previous objectives later. If you think you might forget which objective you skipped or want to revisit, use a text file in the command-line terminal to make notes.

The default language for Exam objectives is English. Click on the Spanish or Portuguese buttons to see objectives presented in the selected language. (All other aspects of the exam, e.g. the communication with proctor and the command-line terminal, will be presented and supported in English only. The alternative language options are only available for the exam objectives.

TERMINAL COMMANDS

Since your terminal is running within your browser, there are several important guidelines that you should pay close attention to. These are shown in your terminal at the start of your exam and are available at any time using man lf_exam:

1. Root privileges can be obtained by running 'sudo -i'.

2. Rebooting of your server IS permitted at anytime.

3. Do not stop or tamper with the Gate One process as this will END YOUR EXAM SESSION.

4. Do not block incoming ports 8080/tcp, 4505/tcp and 4506/tcp. This includes firewall rules that are found within the distribution's default firewall configuration files as well as interactive firewall commands.

5. Use Ctrl+Alt+W instead of Ctrl+W. Ctrl+W is a keyboard shortcut that will close the current tab in Google Chrome.

6. Ctrl+C & and Ctrl+V are NOT supported in your exam terminal, nor is copy and pasting large amounts of text as this may result in instability in your terminal. To copy and paste limited amounts of text (1-2 lines) please use:

   a. Linux: select text for copy and middle button for paste (or both left and right simultaneously if you have no middle button).

   b. Mac: ⌘C to copy and ⌘V to paste.

   c. Windows: Ctrl+Insert to copy and Shift+Insert to paste.

7. Installation of services and applications included in this exam may require modification of system security policies to successfully complete.

8. Only a single terminal console is available during the exam. Terminal multiplexers such as GNU Screen and tmux can be used to create virtual consoles.

ABOUT THE LINUX INSTALLATION FOR EXAMS

You get a standard install of the distro you selected for your Exam. These standard installs may not have all the services that you like to use and may include some services that you actively avoid. You are free to download and install programs and services via your exam terminal, as long as you comply with all exam rules. You may also disable any already configured services. So feel free to install YAST, disable SELinux, or make any other Exam-compliant changes that make you feel more at home while taking the Exam. Just remember to balance your time, as installation and configuration time counts against yourtwo-hour time limit for the Exam.

IV - Checklist for Exam Day

☐ Make sure your government-issued photo ID is available and double check that the name matches your Linux Foundation ID Profile on identity.linuxfoundation.org.

☐ Check your Internet connection and turn on your browser's ability to accept third-party cookies.

☐ Review the guidelines for using the exam terminal to avoid 'muscle memory' accidents using commands that are not supported. Use of Ctrl-C and Ctrl-V resulting in terminal instability is the most common error.

☐ Practice looking up man, info and help pages for a few minutes beforehand. This will help you to get into the rhythm should you need to look something up during the exam.

Conclusion

Achieving a Linux Foundation Certification truly is an achievement, and we hope you find this guide to be helpful in reaching that goal. And in true open source fashion, if you find additional resources that are helpful, please let us know at certificationsupport@linuxfoundation.org and we may include them in a future version.

Thank you for your contribution and good luck!

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The Linux Foundation promotes, protects and standardizes Linux by providing unified resources and services needed for open source to successfully compete with closed platforms.

To learn more about our Linux Training program, please visit us at training.linuxfoundation.org.