UIRÁ RIBEIRO

EXAM LPIC-101 VERSION 5.0

LINUX LPIC-1

CERTIFICATION

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Linux Lpic 101 Certification - Administrator

Guide to the LPIC-101 Exam — Revised and Updated Version

Uirá Ribeiro

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Acknowledgements

The paradox of thanks is almost impossible to be complete and acceptably brief.

In the sacred mystery of life, each heart possesses in the Infinity the soul mate of its divine companion on the journey to glorious immortality. I thank my soul of my mother Carla Cruz, for making me happy in smiles of splendor.

To my “little” great friend, my son, Arthur. Which makes every moment more sweet and funny.

To my friend Jon “Maddog” Hall, who so kindly honored me by writing the preface to this book.

To the thousands of developers and people who do their best by developing the right OpenSource solutions, making life in society ever better.

To the companionship and support of the various people who have been crucial on several occasions, my gratitude.

To God by strength, by health, by our daily bread, and by faith.

Uirá Endy Ribeiro

Belo Horizonte, 06 September 2019

About Author

Uirá Endy Ribeiro has a degree in computer science, postgraduate in telecommunications and Master in Distributed Systems.

Uirá specializes in telecommunications, packet switching networks, Voice over IP, remote access gateways, gatekeepers, ATM, Mid-Range Routers, MAX TNT and APX8000. He is also fluent in UNIX systems SCO, Sun, Linux, Cisco OS, Firewall-One, TCP/IP, BGP-4, H.323, SS7, H.248, Megaco and C#, C++, PHP, Python, Unixshell, MySQL, and Oracle applications development.

He worked as an engineer at Lucent Technologies with Voice over IP Softswitch technology centers. Responsible for the first voice over IP test at Telefonica in São Paulo using protocols G.729, G.723, Fax over IP and data convergence in switching networks. He also participated in the consortium of interoperability of voice over IP networks between Lucent and Alcatel in Chile and NY in the United States.

He was director of Ecobusiness School, a graduate school in the environment, when he developed an integrated distance learning platform with academic control.

He was academic director of Salgado de Oliveira University, Belo Horizonte campus, responsible for 16 undergraduate courses and a team of 170 professors. He also worked as an IT director of the entire Salgado de Oliveira group, responsible for the computer science of 9 teaching units throughout Brazil. Today he runs the campus of Belo Horizonte, with 10 courses and 90 teachers.

For 15 years it has maintained the website www.certificacaolinux.com.br with several OpenSource courses and preparatory courses for the LPI and CompTIA exams, with more than 9,000 students.

He is also the author of the book “Distributed Systems: developing high performance applications on Linux”, “Scientific Methodology: theory and practice”, “TCC — Course Completion Work”, “Linux Certification” and “37 Highly Effective Teachers' Habits”.

Preface

Greetings.

If you are reading these words, it is because you have probably made several decisions.

First of all, you probably know something about the Free Software movement in Brazil, and its importance to the economy of your country. You have probably noticed that there is a source code availability for projects like GNU and the Linux Kernel, through which you can tailor the operating system to better fit your needs or the needs of your employer.

Secondly, you might be using Linux on your PC at home, or maybe you're an administrator of a system like Solaris, AIX, HP/UX, or some other Unix-owned system and soon you started using Linux at work. Or, you feel ready to work in a company that works with the Linux system full-time.

Thirdly, you may have looked in a newspaper and noticed that some job ads are already requiring the candidate to have “LPI Certification”, and you want to know the reason for such a requirement. After all, you already know how to maintain a Linux system!

When I first started in computer science thirty-five years ago, things were much, much simpler than they are today. A programmer just needed to know how to drill cards and how to write in FORTRAN (or COBOL) language. There was no Internet or viruses, only poor graphical interfaces, and main memory was measured in kilobytes, no megabytes or gigabytes. In fact, there was not even any official title for the position we have today as “system administrator”, since each system was run by “operators” who cared about a specific machine, not about the interactivity of several machines working together.

Today, we have to worry about security, network traffic and route tables, subnets, and other network issues. We have to control migration of data and programs from one system to another, and the interoperability of multiple networks and protocols. We have to be able to plan growth as well as solve problems. It is from these needs that originated the tasks and the title of “System Administrator. ”

In recognition of the phenomenal growth of the GNU/ Linux operating system, the Linux Professional Institute, a Canadia-based nonprofit organization, has stipulated a number of qualifications that a Linux system administrator must possess. They also created tests to verify that these assignments are dominated by the administrator in question.

Thus, if the administrator mastered a predefined average of these requirements, then he probably has the necessary knowledge to administer GNU/Linux systems. Keeping the spirit of Free Software, the institute published the objectives of the tests on its

website, so different methods of study can be developed.

This book is an example of a training method to help you achieve this level of knowledge.

Knowledge of GNU/Linux systems alone does not develop a master in systems administration, but for the manager who is hiring, having someone who has passed the LPI test gives you the assurance that he is hiring an administrator with additional performance and measured through certification.

Of course, the contractor can also check the potential of the candidate with their former employers or teachers. And why not also check the employee's previous achievements as listed on your resume? But the fact that the candidate has passed the LPI exams assures the employer that the candidate in question is certainly a BOM GNU/Linux systems administrator.

For those who wish to study and develop a career in Systems Administration, please feel safe when using the objectives listed for each of the LPI exams and see them as a good study guide with the information you should know. Because they are designed for system administrators and system administrators. So even if you do not intend to take LPI exams formally, know that this material will make you a better system administrator.

Finally, welcome this book as it is a relatively cheap guide to studying and achieving your goal of becoming a certified GNU/Linux system administrator.

It will not be the end of your learning, but a GOOD start.

My compliments.

Jon “Maddog” Hall

Executive Director Linux International

How to make the most of this book

This book has a number of examples of commands. It has been agreed that commands starting with “$” are those that can be run with an ordinary user on Linux.

Commands starting with “#” are those that need root super user permissions to be executed. Therefore, if you are going to test these commands, you need to be logged in as root, or use the “sudo” command before the command indicated in the example.

Some commands may accept some parameter or option as optional. When this happens, the workbook will display the parameter in braces [] to indicate that it is optional.

It is possible that trying to run a particular command or view the contents of a given file you encounter some error. This is because not all commands or files may be installed by default on the Linux distribution you chose for studies. This does not mean that the book is wrong, or that the command does not exist, but simply that the command or file in question is not installed. Then you must install the software using the package manager adopted by the distribution you are using.

There may also be slight variations in the path of the files indicated in the book. This is an issue from the distribution you chose that did not follow the standard set by Linux Standard Base (LBL).

As the proof of LPI is neutral, it naturally follows the standard Linux Standard Base, which is right for distributions to follow. This book uses the conventions adopted by LPI and Linux Stardard Base.

For lovers of Ubuntu, I'm sorry to say, but he's very good at not following the line of Linux Standard and switching things around.

This book also has over 130 videos about the exemplified commands, so you can see the use of the command in question in action. To view the videos use your phone with the camera app or QR-code reading app.

This book can also be updated with its latest version via the QR-CODE below:

Demo Book Only - Sorry no Qr-Code for book update

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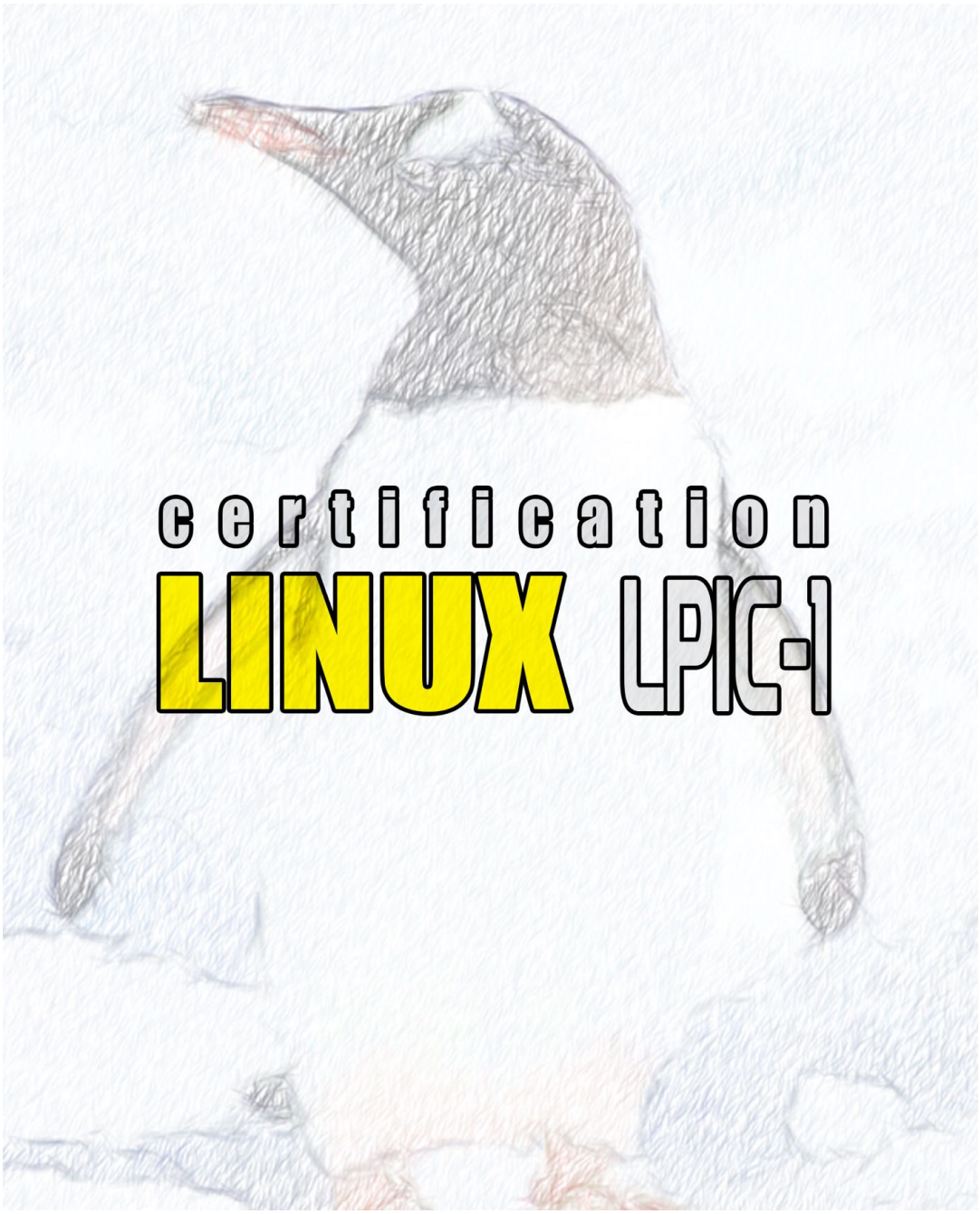
Introduction



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> “Computer science is no longer about computers, just as astronomy is no longer about telescopes.”
> — E. W. Dijkstra

There has always been and will be a gap in the IT market: professionals leaving colleges are not always prepared for what the market wants and needs. Especially in the IT market, where the speed is very high and technologies change and improve every 6 months.

Thus, the IT industry, made up of large companies such as IBM, HP, SuSE, Microsoft, Cisco, Intel, RedHat, Apple, among others, gathered through associations or own certification programs to fill this gap in the market for professionals able to work effectively in their platforms, equipment and technologies.

Two major organizations recognized worldwide to fulfill this role of certifying IT professionals are CompTIA and LPI.

LPI emerged in 1999 with the aim of creating an independent certification of Linux distribution, so that its certified professionals are able to work with any version of Linux. LPI has three certification levels: LPIC-1, LPIC-2 and LPIC-3. Each level aims to certify a professional able to perform tasks that must be performed with an increasing degree of difficulty and complexity.

CompTIA has a more comprehensive certification program for 25 years, embracing a variety of technologies, not just Linux.

In 2012, these two organizations decided to join forces in the Linux world to create a dual certification, so that the professional who certified CompTIA Linux+ Powered by LPI received the CompTIA certificate, as well as the LPI certificate, LPIC-1. This was very good for the Linux market until October 2019. On this date this agreement was dissolved, and CompTIA created its own Linux+ exam, consisting of a single test, Exam XK0-004, which is not covered in this book.

Certification, in addition to being a great incentive, ensuring the entry and sustainability of technicians in the labor market capable of performing tasks on Linux. In this way, the two proofs of LPI 101 and 102 were developed to certify the competence of the administration system using the Linux operating system and its associated tools. It was developed to be distribution-neutral, following Linux Standard Base among other relevant standards and conventions.

The LPI certification tests are named LPIC-101 and LPIC-102 in version 5. To be certified LPI level 1, you must pass both exams.

If you're reading this book, you sure want to have an internationally recognized weight certification on your resume and business card. The free software market is growing and looking for certified professionals. And this is great for you, your career and also your pocket.

The first edition of this book, published in 2005, was acclaimed as the best study book for LPI certification by the BR-LINUX community. This success is the result of a lot of work and empathy from the Linux community. This book is the continuation of this effort, already in its 5th edition.

This is an objective Linux book, didactic and focused on the subjects of the LPI LPIC-101 tests, in the latest version of the test. You will find exactly what you need to study and in the right measure for the exam. There is another volume of this book available with the themes of the LPIC-102 exam.

And in order to meet the objectives, you need to know all the topics of the 101 and 102 exams.

The topics of each LPIC Level 1 certification test are:

EXAM 101:

- Topic 101 — System Architecture;
- Topic 102 — Linux Installation and Package Management;
- Topic 103 — GNU and UNIX Commands;
- Topic 104 — Devices, Linux Filesystems, Filesystem Hierarchy Standard.

EXAM 102:

- Topic 105 — Shell and Shell Scripts;
- Topic 106 — User and Desktop Interface;
- Topic 107 — Administrative Tasks;
- Topic 108 — Essential System Services;
- Topic 109 — Fundamentals and Network Services;
- Topic 110 — Security and Encryption.

Both exams are 90 minutes long and approximately 60 questions. About 75% of the questions are multiple choice where there is only one correct option. Some will present a scenario where some administrative action needs to be taken and others wonder what command is appropriate for a given task.

Another 10% of the questions are multiple choice with more than one correct option. This kind of question is undoubtedly more difficult because only one incorrect option invalidates the whole issue.

This exam will test your theoretical knowledge, commands and your common options, location of important files, syntax of settings, and most commonly used procedures. Once you have managed to solidify the basics of the operating system, this will not be a difficult test and there are usually no questions with ambiguous or malicious answers.

Exams do not intend to ask double interpretation or malicious questions, but the topics

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covered are more complex and require greater experience from the candidate. Particular attention should be paid to safety topics.

How to Score the Trial?

There are two ways to take LPI exams: one with paper exams, with time and place defined by the applicator of the test. Another with exam applied to the computer, with time and place defined by the candidate. Personally I prefer to book the race on a computer at a Pearson Vue center. First because there will almost always be an application center near you and it is you who schedule the test.

Where to find PearsonVue Center?

Choose from their website: http://www. pearsonvue.com. Select “TEST TAKERS”. Then type LPI in the Box that will appear. Then you can click on the “Find a Test Center” button and enter the name of your city.

How is the environment of the test?

The proof made by the computer is simple. This computer sits in a small room closed and isolated from sound and distractions, like a small screen. You can't take anything. You should leave a cell phone, a book, paper, everything in store. They'll give you paper, pencil and an English dictionary if the test is in English. Any strange moves they override your test. You will also be filmed by a webcam during the exam to ensure that it has been properly applied and nothing abnormal has occurred. The exams applied by PearsonVue has been recognized worldwide for their safety and fraud proof.

Another important detail of the computer test is that if you miss a question of any topic, the computer selects more questions from the same topic to further test your knowledge on the topic. This has a good side and a bad side. On the bright side, if you're wrong with “nonsense,” you'll have another chance to redeem your mistake. But if you are in fact not properly prepared for the theme, you will be chipped.

The Importance of Exercising

The brain is a muscle. The more he exercises, the stronger and stronger he gets. More synaptic connections he will be able to make and respond to the environment appropriately. Therefore, do a lot of exercises on the topics. Exercise the controls. See your options and arguments. Test the functionality of each of them.

Many people ask me about which Linux distribution is best suited for certification, testing commands, etc. I always answer: the one you like the most. Unlike other Linux certifications, LPI values distribution independence and neutrality. The proof is focused on LINUX, whatever it is.

All server configuration and management is done with commands in the Shell and directly in the configuration files. This is very good because the professional gets

knowledgeable on any Linux and doesn't get hooked on some friendly tool.

But is there one I indicate? - Yeah. But this is my personal opinion. I like Open-Suse. It's a very stable distribution, made by Germany who are very fond of full obedience to Linux Standard Base standards. The commands, files and structure are exactly what the custom says.

Just one important detail: you'll need to familiarize yourself with Debian and RedHat package managers. And usually a distribution adopts one OR another. And to prepare for the test, you'd better be sharp on both models. Therefore, choose one distribution based on Debian and one on RedHat.

Learning according to the Functioning of Your Brain

You also need to know yourself a little for learning to be effective. Our mind basically works with 3 types of learning styles: physical, visual and linguistic/sound. How do you fix what you've learned better?

Here's what these styles look like and try to identify yourself in them:

Physical

People with these characteristics are the restless ones, they are the pokers, the disassemblers of equipment and toys, the ones who want to know how it works and see inside, the ones who can't stay quiet in their place.

They're people who can't sit around for long. They simply reason better when their bodies are moving, swinging the body between one leg and the other, back and forth. They interact better with the world through manual and body contact. Physical “Apprentices” love sports, invent, build and dance.

When learning or acquiring academic training, these people will benefit more from body expression activities, manipulating and touching objects, performing exercises, etc.

Tips for you to learn better:

• Conduct your studies with assemblies and constructions of objects and simulations;
• Include virtual classes on computers;
• Alternate theoretical and practical sections during the study.

Linguistic/Sound

Are those people who live singing or chanting some sound even with their mouths closed, the singers and those described with having a musical ear. They see sounds in

everything. They may not be the best singers or musicians, but they have a natural ability to interact and understand sounds, musical or not.

His relationship with the world is through sound sounds and rhythms. The activities that can be most beneficial to them are listening to music, playing instruments, interpreting sounds and singing.

When they are learning or acquiring academic training, these people will benefit more by writing lyrics and songs for songs, playing instruments to track their work or others, or developing multimedia projects.

Tips for you to learn better:

- Try to turn what you are learning into music;
- Record what you are learning to listen later;
- Use pleasant music during your studies.

Visuals

These people are modern Picassos and Renoirs, graffiti artists and scribblers, and individuals who have a natural talent for color and harmonizing environments. Visual individuals seem to have an artistic sense that makes everything they create look pleasing to the eye. His relationship with the world is through paintings and images. Activities that can be most beneficial to them include painting, sculpture and the creation of graphic arts.

When learning or acquiring academic training, these people will benefit most from drawing and creating diagrams, including charts, cartographic reading, map creation, or performing demonstrations.

Tips for you to learn better:

- Create multimedia presentations;
- Use interpretation of maps, diagrams and graphs;
- Use and abuse illustrations, graphics, slides, movies etc.

Once you have identified yourself in at least one of these styles, make use of the potential of your brain. This facilitates your learning.

Mind Map

You might be able to get to know this study gimmick called the Mind Map, or herringbone scheme. It is very useful, because in addition to being visual, it helps to organize ideas in a very practical way for memorization. In the entry of the chapters will be presented a mental map scheme of the themes of that topic.

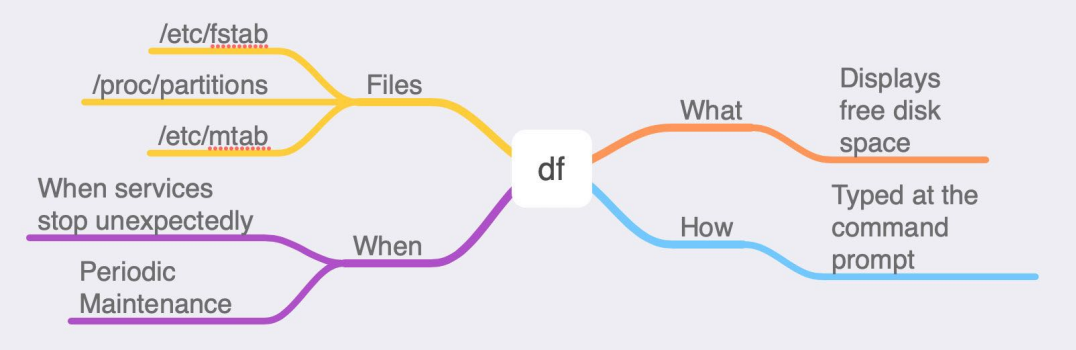

Figure 1 – Mindmap

As an exercise, run each command of each topic at least more than once, exercising possible situations. Ask the following questions for each command studied:

- What is this command for?
- How is it used?
- When is it used?
- What files does it affect?

I suggest you do a herringbone scheme for the commands, so that you work with all the learning potentialities of your brain: visual, physical, and read the text aloud to also exercise the sound side.

In this type of scheme watch out for at least two types of learning style: the physical because you are making movements while writing; visual because you are making a diagram. It also helps with logic and memorization because you are categorizing the information in HOW, WHAT, WHEN and FILES. If possible buy plugs 10x15cm that are excellent for quick consultations and can help you in memorization.

Try to imagine the situations in which commands are used and test the various types of options they have. This is important because an option of a command can reverse the result.

For example, the command “grep uira text.txt” will filter all occurrences of the word “uira” in the text.txt file. The grep with the option “-v” inverts, so the command will show all lines that do not have the word “uira” in the.txt text.

You can resort to the “MAN” manuals of the commands of each topic. They have

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important information that the programmer who developed the software left there in a special way for you. Several commands also have the videos demonstrating their use, which can be accessed through QR-CODE.

You Need to Do Practice Exams!

This item is a complement to the previous one, but it is so important that I have decided to separate it so that you will pay more attention to it.

A mock will give you an exact idea of the kind of evidence questions you'll come across along the way. There are questions that are malely formulated so that you fall into the ditch of common sense.

See that there are issues that will prioritize by simple memorization, others will exercise their ability to analyze a problem of the “real world” and their ability to transpose into the “computer world”; others will exercise their judgment in the face of a problem in question and others will present you a problem and solution and you should evaluate whether the solution is correct or not and why.

The test is meant not to be easy. And this is of paramount importance to attest to the quality of the people who are certified. If anyone with little preparation can be certified, what's the point of displaying this title on the curriculum? But if it's for the few who really devoted themselves and studied in depth, well, it's a weight certification.

On www.certificacaolinux.com, if you enroll in the preparatory course for LPIC-1, you will have access to more than 499 practice questions. A free version of the simulated is also available on the site, with 180 questions.

Finding Help on the Internet

There are good national and international websites on GNU/Linux and subjects related to this system. They provide documents and explanations about configuration, installation, maintenance, documentation, support, etc.

http://www.tldp.org: This site maintains the documentation for the Linux Documentation Project — LDP. It is undoubtedly the ideal place to find information about Linux;

http://www.linux.org : Official GNU/Linux website. Documentation, books, courses, links to distributions and download of applications can be found on this website;

http://www.ibiblio.org/software/linux: The most traditional reference point for GNU/Linux software. You can find from tips, How-Tos documentation and even some GNU/Linux distributions.

http://refspecs.linuxfoundation.org/lsb.shtml: This is the Linux Standard Base

reference, which is the standard of the specifications of what a Linux distribution should look like.

http://refspecs.linuxfoundation.org/fhs.shtml: This is the reference of the Filesystem Hierarchy Standard, which is the default of Linux file and directory hierarchy.

Our Linux Certification Course

The LPI certification training I offer on www.certificacaolinux.com is distance, with fully multimedia classes and with a 95% approval guarantee, as long as you attend the classes and do the simulated ones. You can attend classes whenever you want, as many times as you want, from anywhere, as the course is individualized, dynamic, tasty to do and very practical.

In addition to the classes, the course has 6 types of virtual Linux servers for you to train commands in various situations. The course also has practical courses for you to train problem-solving situations.

The preparatory courses cover all topics of the LPIC-1 and LPIC-2 exams, always updated. I invite the reader to do the Free Simulate for the test and download the Mind Map on the website. And if you want to complement the study of the book with multimedia classes, you have a special discount on acquiring the course for those who already have the book.

On the link http://www.certificacaolinux.com.br/ you will see a demonstration lesson as well as details, amounts and payment methods. And the license plate is quick and easy. You can start studying on the same day.

Command Lessons

This book contains several Qr-Codes that point to short video lessons about the commands mentioned. It's over eight hours of class in total. So, we hope that when reading about the commands, you will also be able to see a video of using the command. In this way, you do not have any doubts and still exercise the 3 learning models: visual, linguistic and physical.

To use QR-CODE, just use the Camera App or QR-CODE Reading App on your phone, point to the QR-CODE and enjoy the lesson.

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Figure 2 – Using the QR-CODE

Linux for you on the web

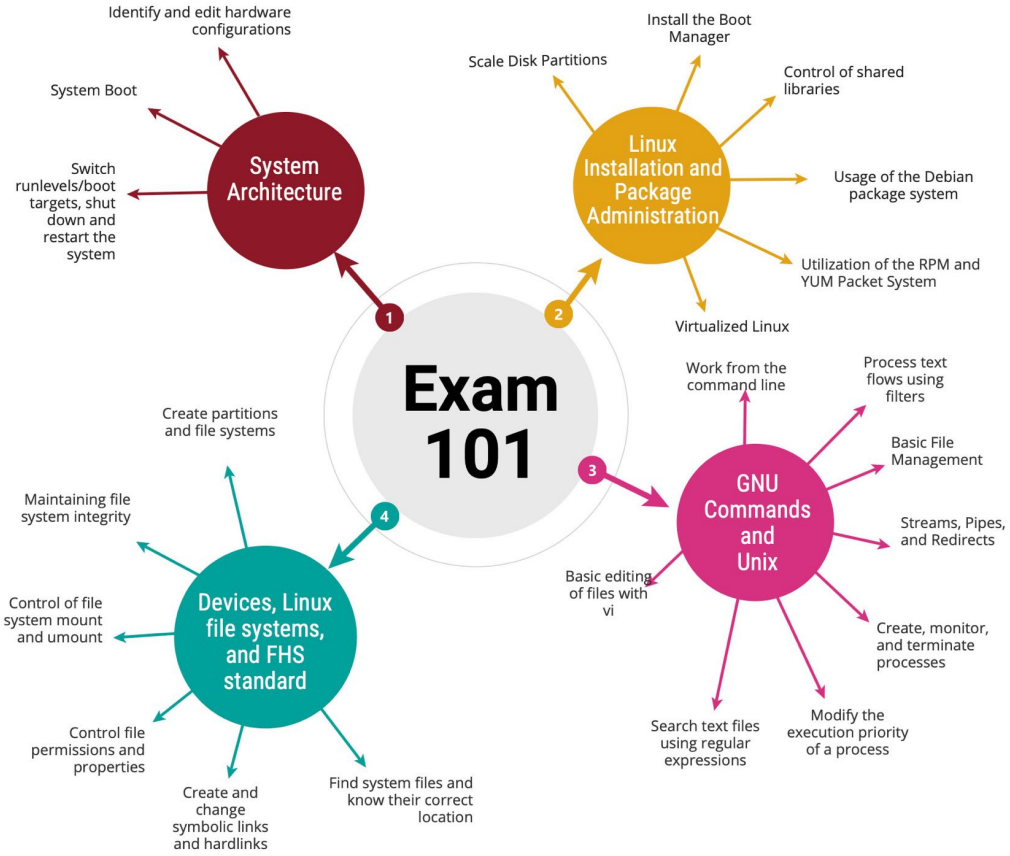
We also provide you with a Linux Fedora Terminal via a browser for you to train all the commands in the book, in an easy and uncomplicated way.

To use this virtual machine you need to open the link using an updated Internet browser such as Firefox, Chrome or Safari. Linux Fedora will run in your browser on a virtual machine running locally on your computer in seconds.

http://bit.ly/labvirtuallinux

"Thou shalt love the Lord thy God with all thy heart, and thy neighbour as thyself." —Jesus - Matthew, 22:36 to 40

Exam 101


Exam 101
1
System Architecture
Identify and edit hardware configurations
System Boot
Switch runlevels/boot targets, shut down and restart the system
2
Linux Installation and Package Administration
Install the Boot Manager
Scale Disk Partitions
Control of shared libraries
Usage of the Debian package system
Utilization of the RPM and YUM Packet System
Virtualized Linux
3
GNU Commands and Unix
Work from the command line
Process text flows using filters
Basic File Management
Streams, Pipes, and Redirects
Create, monitor, and terminate processes
Modify the execution priority of a process
Search text files using regular expressions
Basic editing of files with vi
4
Devices, Linux file systems, and FHS standard
Create partitions and file systems
Maintaining file system integrity
Control of file system mount and umount
Control file permissions and properties
Create and change symbolic links and hardlinks
Find system files and know their correct location