Certification Exam 2
Objectives: LX0-104

INTRODUCTION

- The CompTIA Linux+ [Powered by LPI] certification is a vendor neutral credential. In order to receive CompTIA Linux+ certification, a candidate must pass two exams. The second exam is CompTIA Linux+ [Powered by LPI] exam number LX0-104. This exam measures the remaining competencies (beyond those in exam number LX0-103) required by a junior level Linux administrator, as described in the exam objectives below.

- The successful junior level Linux administrator should be able to:

  o Work at the Linux command line;

  o Perform easy maintenance tasks including assisting users, adding users to a larger system, executing backup & restore, shutdown & reboot;

Install and configure a workstation (including X) and connect it to a LAN, or a stand-alone PC via modem to the Internet.

This examination blueprint includes domain weighting, test objectives, and sample content.

Candidates are encouraged to use this document to guide their studies. The contents of the examination blueprint help prioritize topics and provide a guide of what to expect on this CompTIA Linux+ [Powered by LPI] exam. The table below lists the domains measured by this examination and the extent to which they are represented.

Domain	% of Examination
105 Shells, Scripting and Data Management	17%
106 User Interfaces and Desktops	8%
107 Administrative Tasks	20%
108 Essential System Services	17%
109 Networking Fundamentals	23%
110 Security	15%
Total	**100%**

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**Note: The lists of examples provided in bulleted format below each objective are not exhaustive lists. Other examples of technologies, processes or tasks pertaining to each objective may also be included on the exam although not listed or covered in this objectives document.

CompTIA is constantly reviewing the content of our exams and updating test questions to be sure our exams are current and the security of the questions is protected. When necessary, we will publish updated exams based on existing exam objectives. Please know that all related exam preparation materials will still be valid.

105 Shells, Scripting and Data Management

105.1 Customize and use the shell environment.

- Set environment variables (e.g. PATH) at login or when spawning a new shell.

- Write BASH functions for frequently used sequences of commands.

- Maintain skeleton directories for new user accounts.

- Set command search path with the proper directory.

- The following is a partial list of the used files, terms, and utilities:

    o Source

    o /etc/bash.bashrc

    o /etc/profile

    o env

    o export

    o set

    o unset

    o ~/.bash_profile

    o ~/.bash_login

    o ~/.profile

    o ~/.bashrc

    o ~/.bash_logout

    o function

    o alias

    o lists

105.2 Customize or write simple scripts.

- Use standard sh syntax (loops, tests).

- Use command substitution.

- Test return values for success or failure or other information provided by a command.

- Perform conditional mailing to the superuser.

- Correctly select the script interpreter through the shebang (#!) line.

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

- The following is a partial list of the used files, terms, and utilities:

- for
- while
- test
- if
- read
- seq
- exec

105.3   SQL data management

- Use of basic SQL commands.

- Perform basic data manipulation.

- The following is a partial list of the used files, terms, and utilities:

  - insert
  - update
  - select
  - delete
  - from
  - where
  - group by
  - order by
  - join

106 User Interfaces and Desktops

106.1   Install and configure X11.

- Verify that the video card and monitor are supported by an X server.
- Awareness of the X font server.
- Basic understanding and knowledge of the X Window configuration file.
- The following is a partial list of the used files, terms, and utilities:

  - /etc/X11/xorg.conf
  - xhost
  - DISPLAY

- o xwininfo

- o xdpyinfo

- o X

106.2 Setup a display manager.

- Basic configuration of LightDM

- Turn the display manager on or off.

- Change the display manager greeting.

- Awareness of XDM, KDM and GDM.

- The following is a partial list of the used files, terms, and utilities:

    - o lightdm

    - o /etc/lightdm/

106.3 Accessibility

- Basic knowledge of keyboard accessibility settings (AccessX).

- Basic knowledge of visual settings and themes.

- Basic knowledge of assistive technology (ATs).

- The following is a partial list of the used files, terms, and utilities:

    - o Sticky/Repeat Keys

    - o Slow/Bounce/Toggle Keys

    - o Mouse Keys

    - o High Contrast/Large Print Desktop Themes

    - o Screen Reader

    - o Braille Display

    - o Screen Magnifier

    - o On-Screen Keyboard

    - o Gestures (used at login, for example gdm)

    - o Orca

    - o GOK

    - o emacspeak

107 Administrative Tasks

107.1 Manage user and group accounts and related system files.

- Add, modify and remove users and groups.

- Manage user/group info in password/group databases.

- Create and manage special purpose and limited accounts.

- The following is a partial list of the used files, terms, and utilities:

    o /etc/passwd

    o /etc/shadow

    o /etc/group

    o /etc/skel

    o chage

    o getent

    o groupadd

    o groupdel

    o groupmod

    o passwd

    o useradd

    o userdel

    o usermod

107.2 Automate system administration tasks by scheduling jobs.

- Manage cron and at jobs.
- Configure user access to cron and at services.

- Configure anacron.

- The following is a partial list of the used files, terms, and utilities:

    o /etc/cron.{d,daily,hourly,monthly,weekly}

    o /etc/at.deny

    o /etc/at.allow

    o /etc/crontab

    o /etc/cron.allow

- o /etc/cron.deny

- o /var/spool/cron/*

- o crontab

- o at

- o atq

- o atrm

- o anacron

- o /etc/anacrontab

107.3 Localisation and internationalisation.

- Configure locale settings and environment variables.

- Configure timezone settings and environment variables.

- The following is a partial list of the used files, terms, and utilities:

    - o /etc/timezone

    - o /etc/localtime

    - o /usr/share/zoneinfo

    - o Environment variables:

        - LC_*

        - LC_ALL

        - LANG

        - *TZ*

    - o /usr/bin/locale

    - o tzselect

    - o tzconfig

    - o date

    - o iconv

    - o UTF-8

    - o ISO-8859

    - o ASCII

    - o Unicode

108 Essential System Services

108.1   Maintain system time.

- Set the system date and time.

- Set the hardware clock to the correct time in UTC.

- Configure the correct timezone.

- Basic NTP configuration.

- Knowledge of using the pool.ntp.org service.

- Awareness of the ntpq command.

- The following is a partial list of the used files, terms, and utilities:

    - /usr/share/zoneinfo

    - /etc/timezone

    - /etc/localtime

    - /etc/ntp.conf

    - date

    - hwclock

    - ntpd

    - ntpdate

    - pool.ntp.org

108.2   System logging

- Configuration of the syslog daemon.

- Understanding of standard facilities, priorties and actions.

- Configuration of logrotate.

- Awareness of rsyslog and syslog-ng.

- The following is a partial list of the used files, terms, and utilities:

    - syslog.conf

    - syslogd

    - klogd

    - /var/log/

    - logger

    - logrotate

- o /etc/logrotate.conf

- o /etc/logrotate.d/

- o Journalctl

- o /etc/systemd/journald.conf

- o /var/log/journal/

108.3 Mail Transfer Agent (MTA) basics.

- Create e-mail aliases.

- Configure e-mail forwarding.

- Knowledge of commonly available MTA programs (postfix, sendmail, qmail, exim) (no configuration).

- The following is a partial list of the used files, terms, and utilities:

    - o ~/.forward

    - o sendmail emulation layer commands

    - o newaliases

    - o mail

    - o mailq

    - o postfix

    - o sendmail

    - o exim

    - o qmail

108.4 Manage printers and printing.

- Basic CUPS configuration (for local and remote printers).

- Manage user print queues.

- Troubleshoot general printing problems.

- Add and remove jobs from configured printer queues.

- The following is a partial list of the used files, terms, and utilities:

    - o CUPS configuration files, tools and utilities

    - o /etc/cups

    - o lpd legacy interface (lpr, lprm, lpq)

109 Networking Fundamentals

109.1 Fundamentals of internet protocols.

- Demonstrate an understanding network masks and CIDR notation.
- Knowledge of the differences between private and public "dotted quad" IP-Addresses.
- Knowledge about common TCP and UDP ports (20, 21, 22, 23, 25, 53, 80, 110, 123, 139, 143, 161, 162, 389, 443, 465, 514, 636, 993, 995).
- Knowledge about the differences and major features of UDP, TCP and ICMP.
- Knowledge of the major differences between IPv4 and IPv6.
- *Knowledge of the basic features of* IPv6.
- The following is a partial list of the used files, terms, and utilities:
    - /etc/services
    - IPv4, IPv6
    - Subnetting
    - TCP, UDP, ICMP

109.2 Basic network configuration

- Manually and automatically configure network interfaces.
- Basic TCP/IP host configuration.
- Setting a default route.
- The following is a partial list of the used files, terms, and utilities:
    - /etc/hostname
    - /etc/hosts
    - /etc/nsswitch.conf
    - ifconfig
    - ifup
    - ifdown
    - ip
    - route
    - ping

109.3 Basic network troubleshooting.

- Manually and automatically configure network interfaces and routing tables to include adding, starting, stopping, restarting, deleting or reconfiguring network interfaces.

- Change, view or configure the routing table and correct an improperly set default route manually.
- Debug problems associated with the network configuration.

- The following is a partial list of the used files, terms, and utilities:

    - ifconfig

    - ip

    - ifup

    - ifdown

    - route

    - host

    - hostname

    - dig

    - netstat

    - ping

    - ping6
    - traceroute

    - traceroute6

    - tracepath

    - tracepath6

    - netcat

109.4 Configure client side DNS.

- Query remote DNS servers.
- Configure local name resolution and use remote DNS servers.
- Modify the order in which name resolution is done.

- The following is a partial list of the used files, terms, and utilities:

    - /etc/hosts

    - /etc/resolv.conf

    - /etc/nsswitch.conf

    - Host

    - Dig

    - getent

110 Security

110.1 Perform security administration tasks.

- Audit a system to find files with the suid/sgid bit set.
- Set or change user passwords and password aging information.
- Being able to use nmap and netstat to discover open ports on a system.
- Set up limits on user logins, processes and memory usage.
- Determine which users have logged in to the system or are currently logged in.
- Basic sudo configuration and usage.
- The following is a partial list of the used files, terms, and utilities:
  - find
  - passwd
  - fuser
  - lsof
  - nmap
  - chage
  - netstat
  - sudo
  - /etc/sudoers
  - su
  - usermod
  - ulimit
  - who, w, last

110.2 Setup host security.

- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- The following is a partial list of the used files, terms, and utilities:
  - /etc/nologin
  - /etc/passwd
  - /etc/shadow
  - /etc/xinetd.d/*

- o /etc/xinetd.conf

- o /etc/inetd.d/*

- o /etc/inetd.conf

- o /etc/inittab

- o /etc/init.d/*

- o /etc/hosts.allow

- o /etc/hosts.deny

110.3   Securing data with encryption.

- Perform basic OpenSSH 2 client configuration and usage.

- Understand the role of OpenSSH 2 server host keys.

- Perform basic GnuPG configuration, usage, and *revocation*.

- Understand SSH port tunnels (including X11 tunnels).

- The following is a partial list of the used files, terms, and utilities:

    - o ssh

    - o ssh-keygen

    - o ssh-agent

    - o ssh-add

    - o ~/.ssh/id_rsa and id_rsa.pub

    - o ~/.ssh/id_dsa and id_dsa.pub

    - o /etc/ssh/ssh_host_rsa_key and ssh_host_rsa_key.pub

    - o /etc/ssh/ssh_host_dsa_key and ssh_host_dsa_key.pub

    - o ~/.ssh/authorized_keys

    - o /etc/ssh_known_hosts

    - o gpg

    - o ~/.gnupg/*

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