

LPI 101/102

Topics overview

LPI-102

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Topic 105: Kernel

Total weight for this topic

7

1.105.1	Manage/Query kernel and kernel modules at runtime.....	4
1.105.2	Reconfigure, build, and install a custom kernel and kernel modules.....	3

1.105.1 Manage/Query kernel and kernel modules at runtime

Description: Candidates should be able to manage and/or query a kernel and kernel loadable modules. This objective includes using command-line utilities to get information about the currently running kernel and kernel modules. It also includes manually loading and unloading modules as appropriate. It also includes being able to determine when modules can be unloaded and what parameters a module accepts. Candidates should be able to configure the system to load modules by names other than their file name.

Weight: 4

Key files, terms, and utilities include:

```
/lib/modules/kernel-version/modules.dep  
/etc/modules.conf & /etc/conf.modules  
depmod  
insmod  
lsmod  
rmmmod  
modinfo  
modprobe
```

1.105.2 Reconfigure, build, and install a custom kernel and kernel modules

Description: Candidates should be able to customize, build, and install a kernel and kernel loadable modules from source. This objective includes customizing the current kernel configuration, building a new kernel, and building kernel modules as appropriate. It also includes installing the new kernel as well as any modules, and ensuring that the boot manager can locate the new kernel and associated files (generally located under /boot, see objective 1.102.2 for more details about boot manager configuration).

Weight: 3

Key files, terms, and utilities include:

```
/usr/src/linux/*                               /usr/src/linux/.config  
/lib/modules/kernel-version/*                 /boot/*  
make  
make targets: config, menuconfig, xconfig, oldconfig, modules,  
install, modules_install, depmod
```

Topic 106: Boot, Initialization, Shutdown and Runlevels

Total weight for this topic	6
1.106.1 Boot the system.....	3
1.106.2 Change runlevels and shutdown or reboot system.....	3

1.106.1 Boot the system

Description: Candidates should be able to guide the system through the booting process. This includes giving commands to the boot loader and giving options to the kernel at boot time, and checking the events in the log files.

Weight: 3

Key files, terms, and utilities include:

`/var/log/messages`
`/etc/conf.modules` or `/etc/modules.conf`
dmesg
LILO
GRUB

1.106.2 Change runlevels and shutdown or reboot system

Description: Candidates should be able to manage the runlevel of the system. This objective includes changing to single user mode, shutdown or rebooting the system. Candidates should be able to alert users before switching runlevel, and properly terminate processes. This objective also includes setting the default runlevel.

Weight: 3

Key files, terms, and utilities include:

`/etc/inittab`
shutdown
poweroff
init

Topic 107: Printing

Total weight for this topic **3**

1.107.2	Manage printers and print queues.....	1
1.107.3	Print files.....	1
1.107.4	Install and configure local and remote printers.....	1

1.107.2 Manage printers and print queues

Description: Candidates should be able to manage print queues and user print jobs. This objective includes monitoring print server and user print queues and troubleshooting general printing problems.

Weight: 1

Key files, terms, and utilities include:

```
/etc/printcap  
lpc  
lpq  
lprm  
lp
```

1.107.3 Print files

Description: Candidates should be able to manage print queues and manipulate print jobs. This objective includes adding and removing jobs from configured printer queues and converting text files to postscript for printing.

Weight: 1

Key files, terms, and utilities include:

```
lpr  
lpq  
mpage
```

1.107.4 Install and configure local and remote printers

Description: Candidate should be able to install a printer daemon, install and configure a print filter (e.g.: apsfilter, magicfilter). This objective includes making local and remote printers accessible for a Linux system, including postscript, non-postscript, and Samba printers.

Weight: 1

Key files, terms, and utilities include:

```
/etc/printcap  
/etc/apsfilter/*  
/var/lib/apsfilter/*  
lpd  
/var/spool/lpd/*/  
/etc/magicfilter/*/
```

Topic 108: Documentation

Total weight for this topic	8
1.108.1 Use and manage local system documentation.....	4
1.108.2 Find Linux documentation on the Internet.....	3
1.108.5 Notify users on system-related issues.....	1

1.108.1 Use and manage local system documentation

Description: Candidates should be able to use and administer the man facility and the material in `/usr/share/doc/`. This objective includes finding relevant man pages, searching man page sections, finding commands and man pages related to them, and configuring access to man sources and the man system. It also includes using system documentation stored in `/usr/share/doc/` and determining what documentation to keep in `/usr/share/doc/`.

Weight: 4

Key files, terms, and utilities include:

MANPATH
man
apropos
whatis

1.108.2 Find Linux documentation on the Internet

Description: Candidates should be able to find and use Linux documentation. This objective includes using Linux documentation at sources such as the Linux Documentation Project (LDP), vendor and third-party websites, newsgroups, newsgroup archives, and mailing lists.

Weight: 3

Key files, terms, and utilities include:

not applicable

1.108.5 Notify users on system-related issues

Description: Candidates should be able to notify the users about current issues related to the system. This objective includes automating the communication process, e.g. through logon messages.

Weight: 1

Key files, terms, and utilities include:

`/etc/issue`
`/etc/issue.net`
`/etc/motd`

Topic 109: Shells, Scripting, Programming and Compiling

Total weight for this topic	8
1.109.1 Customize and use the shell environment.....	5
1.109.2 Customize or write simple scripts.....	3

1.109.1 Customize and use the shell environment

Description: Candidate should be able to customize shell environments to meet users' needs. This objective includes setting environment variables (e.g. PATH) at login or when spawning a new shell. It also includes writing bash functions for frequently used sequences of commands.

Weight: 5

Key files, terms, and utilities include:

~/.bash_profile	function	(Bash built-in command)
~/.bash_login	set	(Bash built-in command)
~/.profile	unset	(Bash built-in command)
~/.bashrc	env	
~/.bash_logout	export	
~/.inputrc		

1.109.2 Customize or write simple scripts

Description: Candidate should be able to customize existing scripts, or write simple new (ba)sh scripts. This objective includes using standard sh syntax (loops, tests), using command substitution, testing command return values, testing of file status, and conditional mailing to the superuser. This objective also includes making sure the correct interpreter is called on the first (!) line of scripts. This objective also includes managing location, ownership, execution and suid-rights of scripts.

Weight: 3

Key files, terms, and utilities include:

while
for
test
chmod

Topic 111: Administrative Tasks

Total weight for this topic

21

1.111.1	Manage users and group accounts and related system files.....	4
1.111.2	Tune the user environment and system environment variables.....	3
1.111.3	Configure and use system log files to meet admin and security needs.....	3
1.111.4	Automate system admintasks by scheduling jobs to run in the future.....	4
1.111.5	Maintain an effective data backup strategy.....	3
1.111.6	Maintain system time.....	4

1.111.1 Manage users and group accounts and related system files

Description: Candidate should be able to add, remove, suspend and change user accounts. Tasks include to add and remove groups, to change user/group info in passwd/group databases. The objective also includes creating special purpose and limited accounts.

Weight: 4

Key files, terms, and utilities include:

/etc/passwd	useradd	groupadd	pwconv
/etc/shadow	passwd	gpasswd	pwunconv
/etc/group	usermod	groupmod	grpconv
/etc/gshadow	userdel	groupdel	grpunconv
chage			

1.111.2 Tune the user environment and system environment variables

Description: Candidate should be able to modify global and user profiles. This includes setting environment variables, maintaining skel directories for new user accounts and setting command search path with the proper directory.

Weight: 3

Key files, terms, and utilities include:

env	/etc/profile
export	/etc/skel
set	unset

1.111.3 Configure and use system log files to meet administrative and security needs

Description: Candidate should be able to configure system logs. This objective includes managing the type and level of information logged, manually scanning log files for notable activity, monitoring log files, arranging for automatic rotation and archiving of logs and tracking down problems noted in logs.

Weight: 3

Key files, terms, and utilities include:

/etc/syslog.conf

/var/log/*

logrotate

tail -f

1.111.4 Automate system administration tasks by scheduling jobs to run in the future

Description: Candidate should be able to use cron or anacron to run jobs at regular intervals and to use at to run jobs at a specific time. Task include managing cron and at jobs and configuring user access to cron and at services.

Weight: 4

Key files, terms, and utilities include:

/etc/anacrontab at

/etc/at.deny atq

/etc/at.allow atrm

/etc/crontab crontab

/etc/cron.allow

/etc/cron.deny

/var/spool/cron/*

1.111.5 Maintain an effective data backup strategy

Description: Candidate should be able to plan a backup strategy and backup file systems automatically to various media. Tasks include dumping a raw device to a file or vice versa, performing partial and manual backups, verifying the integrity of backup files and partially or fully restoring backups.

Weight: 3

Key files, terms, and utilities include:

cpio

dd

dump

restore

tar

1.111.6 Maintain system time

Description: Candidate should be able to properly maintain the system time and synchronize the clock over NTP. Tasks include setting the system date and time, setting the BIOS clock to the correct time in UTC, configuring the correct timezone for the system and configuring the system to correct clock drift to match NTP clock.

Weight: 4

Key files, terms, and utilities include:

<code>/usr/share/zoneinfo</code>	<code>date</code>
<code>/etc/timezone</code>	<code>hwclock</code>
<code>/etc/localtime</code>	<code>ntpd</code>
<code>/etc/ntp.conf</code>	<code>ntpdate</code>
<code>/etc/ntp.drift</code>	

Topic 112: Networking Fundamentals

Total weight for this topic	14
1.112.1 Fundamentals of TCP/IP.....	4
1.112.3 TCP/IP configuration and troubleshooting.....	7
1.112.4 Configure Linux as a PPP client.....	3

1.112.1 Fundamentals of TCP/IP

Description: Candidates should demonstrate a proper understanding of network fundamentals. This objective includes the understanding of IP-addresses, network masks and what they mean (i.e. determine a network and broadcast address for a host based on its subnet mask in "dotted quad" or abbreviated notation or determine the network address, broadcast address and netmask when given an IP-address and number of bits). It also covers the understanding of the network classes and classless subnets (CIDR) and the reserved addresses for private network use. It includes the understanding of the function and application of a default route. It also includes the understanding of basic internet protocols (IP, ICMP, TCP, UDP) and the more common TCP and UDP ports (20, 21, 23, 25, 53, 80, 110, 119, 139, 143, 161).

Weight: 4

Key files, terms, and utilities include:

/etc/services

ftp

whois

ping

dig

telnet

traceroute

host

1.112.3 TCP/IP configuration and troubleshooting

Description: Candidates should be able to view, change and verify configuration settings and operational status for various network interfaces. This objective includes manual and automatic configuration of interfaces and routing tables. This especially means to add, start, stop, restart, delete or reconfigure network interfaces. It also means to change, view or configure the routing table and to correct an improperly set default route manually. Candidates should be able to configure Linux as a DHCP client and a TCP/IP host and to debug problems associated with the network configuration.

Weight: 7

Key files, terms, and utilities include:

/etc/HOSTNAME or /etc/hostname

ifconfig

route

/etc/hosts

host

netstat

/etc/networks

ping

traceroute

/etc/host.conf

tcpdump

/etc/resolv.conf

dhcpcd, dhcpcclient, pump

/etc/nsswitch.conf

hostname (domainname, dnsdomainname)

and the network scripts run during system initialization.

1.112.4 Configure Linux as a PPP client

Description: Candidates should understand the basics of the PPP protocol and be able to configure and use PPP for outbound connections. This objective includes the definition of the chat sequence to connect (given a login example) and the setup commands to be run automatically when a PPP connection is made. It also includes initialization and termination of a PPP connection, with a modem, ISDN or ADSL and setting PPP to automatically reconnect if disconnected.

Weight: 3

Key files, terms, and utilities include:

```
/etc/ppp/options.*  
/etc/ppp/peers/*  
/etc/wvdial.conf  
/etc/ppp/ip-up  
/etc/ppp/ip-down  
wvdial  
pppd
```

Topic 113: Networking Services

Total weight for this topic 24

1.113.1	Configure and manage inetd, xinetd, and related services.....	4
1.113.2	Operate and perform basic configuration of sendmail.....	4
1.113.3	Operate and perform basic configuration of Apache.....	4
1.113.4	Properly manage the NFS, smb, and nmb daemons.....	4
1.113.5	Setup and configure basic DNS services.....	4
1.113.7	Set up secure shell (OpenSSH).....	4

1.113.1 Configure and manage inetd, xinetd, and related services

Description: Candidates should be able to configure which services are available through inetd, use tcpwrappers to allow or deny services on a host-by-host basis, manually start, stop, and restart internet services, configure basic network services including telnet and ftp. Set a service to run as another user instead of the default in inetd.conf.

Weight: 4

Key files, terms, and utilities include:

<code>/etc/inetd.conf</code>	<code>/etc/services</code>
<code>/etc/xinetd.log</code>	<code>/etc/hosts.allow</code>
<code>/etc/xinetd.conf</code>	<code>/etc/hosts.deny</code>

1.113.2 Operate and perform basic configuration of sendmail

Description: Candidate should be able to modify simple parameters in sendmail configuration files (including the "Smart Host" parameter, if necessary), create mail aliases, manage the mail queue, start and stop sendmail, configure mail forwarding and perform basic troubleshooting of sendmail. The objective includes checking for and closing open relay on the mail server. It does not include advanced custom configuration of Sendmail.

Weight: 4

Key files, terms, and utilities include:

<code>/etc/aliases</code> or <code>/etc/mail/aliases</code>	<code>mailq</code>
<code>/etc/mail/*</code>	<code>sendmail</code>
<code>~/.forward</code>	<code>newaliases</code>

LPI-102 Doesn't require deep knowledge of sendmail.

Just the configuration of a simple mail server.

1.113.3 Operate and perform basic configuration of Apache

Description: Candidates should be able to modify simple parameters in Apache configuration files, start, stop, and restart httpd, arrange for automatic restarting of httpd upon boot. Does not include advanced custom configuration of Apache.

Weight: 4

Key files, terms, and utilities include:

<code>httpd.conf</code>	<code>httpd</code>	<code>apachectl</code>
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1.113.4 .Properly manage the NFS, smb, and nmb daemons

Description: Candidate should know how to mount remote filesystems using NFS, configure NFS for exporting local filesystems, start, stop, and restart the NFS server. Install and configure Samba using the included GUI tools or direct edit of the /etc/smb.conf file (Note: this deliberately excludes advanced NT domain issues but includes simple sharing of home directories and printers, as well as correctly setting the nmbd as a WINS client).

Weight: 4

Key files, terms, and utilities include:

/etc/exports	mount
/etc/fstab	umount
/etc/smb.conf	

1.113.5 Setup and configure basic DNS services

Description: Candidate should be able to configure hostname lookups and troubleshoot problems with local caching-only name server. Requires an understanding of the domain registration and DNS translation process. Requires understanding key differences in configuration files for bind 4 and bind 8.

Weight: 4

Key files, terms, and utilities include:

/etc/hosts	/etc/nsswitch.conf
/etc/resolv.conf	named
/etc/named.boot (v.4) or /etc/named.conf (v.8)	

1.113.7 Set up secure shell (OpenSSH)

Description: The candidate should be able to obtain and configure OpenSSH. This objective includes basic OpenSSH installation and troubleshooting, as well as configuring sshd to start at system boot.

Weight: 4

Key files, terms, and utilities include:

/etc/hosts.allow	sshd
/etc/hosts.deny	ssh-keygen
/etc/nologin	
/etc/ssh/sshd_config	
/etc/ssh_known_hosts	
/etc/sshrc	

Topic 114: Security

Total weight for this topic	8
1.114.1 Perform security administration tasks.....	4
1.114.2 Setup host security.....	3
1.114.3 Setup user level security.....	1

1.114.1 Perform security administration tasks

Description: Candidates should know how to review system configuration to ensure host security in accordance with local security policies. This objective includes how to configure TCP wrappers, find files with SUID/SGID bit set, verify packages, set or change user passwords and password aging information, update binaries as recommended by CERT, BUGTRAQ, and/or distribution's security alerts. Includes basic knowledge of ipchains and iptables.

Weight: 4

Key files, terms, and utilities include:

find	<code>/proc/net/ip_fwchains</code>
ipchains	<code>/proc/net/ip_fwnames</code>
iptables	<code>/proc/net/ip_masquerade</code>
passwd	socket

1.114.2 Setup host security

Description: Candidate should know how to set up a basic level of host security. Tasks include syslog configuration, shadowed passwords, set up of a mail alias for root's mail and turning of all network services not in use.

Weight: 3

Key files, terms, and utilities include:

```
/etc/inetd.conf or /etc/inet.d/*  
/etc/nologin  
/etc/passwd  
/etc/shadow  
/etc/syslog.conf
```

1.114.3 Setup user level security

Description: Candidate should be able to configure user level security. Tasks include limits on user logins, processes, and memory usage.

Weight: 1

Key files, terms, and utilities include:

```
quota          ulimit  
usermod
```