Topic 105: Shells and Shell Scripting

105.1		Customize and use the shell environment
	Weight	4
	Description	Candidates should be able to customize shell environments to meet users' needs. Candidates should be able to modify global and user profiles.
	Key Knowledge Areas	• 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	• . • source • /etc/bash.bashrc • /etc/profile • env • export • set • unset • ~/.bash_profile • ~/.bash_login • ~/.profile • ~/.bashrc • ~/.bash_logout • function • alias

105.2		Customize or write simple scripts
	Weight	4
	Description	Candidates should be able to customize existing scripts, or write simple new Bash scripts.
	Key Knowledge Areas	• Use standard sh syntax (loops, tests). • Use command substitution. • Test return values for success or failure or other information provided by a command. • Execute chained commands. • 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 • || • &&

Topic 106: User Interfaces and Desktops

106.1		Install and configure X11
	Weight	2
	Description	Candidates should be able to install and configure X11.
	Key Knowledge Areas	- Understanding of the X11 architecture. - Basic understanding and knowledge of the X Window configuration file. - Overwrite specific aspects of Xorg configuration, such as keyboard layout. - Understand the components of desktop environments, such as display managers and window managers. - Manage access to the X server and display applications on remote X servers. - Awareness of Wayland.
	The following is a partial list of the used files, terms and utilities	/etc/X11/xorg.conf /etc/X11/xorg.conf.d/ ~/.xsession-errors - xhost - xauth - DISPLAY - X

106.2		Graphical Desktops
	Weight	1
	Description	Candidates should be aware of major Linux desktops. Furthermore, candidates should be aware of protocols used to access remote desktop sessions.
	Key Knowledge Areas	- Awareness of major desktop environments - Awareness of protocols to access remote desktop sessions
	The following is a partial list of the used files, terms and utilities	- KDE - Gnome - Xfce - X11 - XDMCP - VNC - Spice - RDP

106.3		Accessibility
	Weight	1
	Description	Demonstrate knowledge and awareness of accessibility technologies.
	Key Knowledge Areas	- Basic knowledge of visual settings and themes. - Basic knowledge of assistive technology.
	The following is a partial list of the used files, terms and utilities	- High Contrast/Large Print Desktop Themes. - Screen Reader. - Braille Display. - Screen Magnifier. - On-Screen Keyboard. - Sticky/Repeat keys. - Slow/Bounce/Toggle keys. - Mouse keys. - Gestures. - Voice recognition.

Topic 107: Administrative Tasks

107.1		Manage user and group accounts and related system files
	Weight	5
	Description	Candidates should be able to add, remove, suspend and change user accounts.
	Key Knowledge Areas	• 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	• /etc/passwd • /etc/shadow • /etc/group • /etc/skel/ • chage	• getent • groupadd • groupdel • groupmod • passwd	• useradd • userdel • usermod

107.2		Automate system administration tasks by scheduling jobs
	Weight	4
	Description	Candidates should be able to use cron and systemd timers to run jobs at regular intervals and to use at to run jobs at a specific time.
	Key Knowledge Areas	• Manage cron and at jobs. • Configure user access to cron and at services. • Understand systemd timer units.
	The following is a partial list of the used files, terms and utilities	• /etc/cron.{d,daily,hourly,monthly,weekly}/ • /etc/at.deny • /etc/at.allow • /etc/crontab • /etc/cron.allow • /etc/cron.deny • /var/spool/cron/ • crontab • at • atq • atrm • systemctl • systemd-run

107.3		Localisation and internationalisation
	Weight	3
	Description	Candidates should be able to localize a system in a different language than English. As well, an understanding of why LANG=C is useful when scripting.
	Key Knowledge Areas	• 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	• /etc/timezone • /etc/localtime • /usr/share/zoneinfo/ • LC_* • LC_ALL • LANG • TZ • /usr/bin/locale • tzselect	• timedatectl • date • iconv • UTF-8 • ISO-8859 • ASCII • Unicode

Topic 108: Essential System Services

108.1		Maintain system time
	Weight	3
	Description	Candidates should be able to properly maintain the system time and synchronize the clock via NTP.
	Key Knowledge Areas	- Set the system date and time. - Set the hardware clock to the correct time in UTC. - Configure the correct timezone. - Basic NTP configuration using ntpd and chrony. - 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 /etc/chrony.conf - date - hwclock - timedatectl - ntpd - ntpdate - chronyc - pool.ntp.org

108.2		System logging
	Weight	4
	Description	Candidates should be able to configure rsyslog. This objective also includes configuring the logging daemon to send log output to a central log server or accept log output as a central log server. Use of the systemd journal subsystem is covered. Also, awareness of syslog and syslog-ng as alternative logging systems is included.
	Key Knowledge Areas	- Basic configuration of rsyslog. - Understanding of standard facilities, priorities and actions. - Query the systemd journal. - Filter systemd journal data by criteria such as date, service or priority. - Configure persistent systemd journal storage and journal size. - Delete old systemd journal data. - Retrieve systemd journal data from a rescue system or file system copy. - Understand interaction of rsyslog with systemd-journald. - Configuration of logrotate. - Awareness of syslog and syslog-ng.
	Terms and Utilities	/etc/rsyslog.conf /var/log/ - logger - logrotate /etc/logrotate.conf /etc/logrotate.d/ - journalctl - systemd-cat /etc/systemd/journald.conf /var/log/journal/

108.3		Mail Transfer Agent (MTA) basics
	Weight	3
	Description	Candidates should be aware of the commonly available MTA programs and be able to perform basic forward and alias configuration on a client host. Other configuration files are not covered.
	Key Knowledge Areas	• Create e-mail aliases. Configure e-mail forwarding. Knowledge of commonly available MTA programs (postfix, sendmail, exim) (no configuration).
	Terms and Utilities	• ~/.forward • sendmail emulation layer commands • newaliases • mail • mailq • postfix • sendmail • exim

108.4		Manage printers and printing
	Weight	2
	Description	Candidates should be able to manage print queues and user print jobs using CUPS and the LPD compatibility interface.
	Key Knowledge Areas	• 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	• CUPS configuration files, tools and utilities • /etc/cups/ • lpd legacy interface (lpr, lprm, lpq)

Topic 109: Networking Fundamentals

109.1		Fundamentals of internet protocols
	Weight	4
	Description	Candidates should demonstrate a proper understanding of TCP/IP network fundamentals.
	Key Knowledge Areas	• Demonstrate an understanding of network masks and CIDR notation. • Knowledge of the differences between private and public "dotted quad" IP addresses. • Knowledge about common TCP and UDP ports and services (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		Persistent network configuration
	Weight	4
	Description	Candidates should be able to manage the persistent network configuration of a Linux host.
	Key Knowledge Areas	• Understand basic TCP/IP host configuration. • Configure ethernet and wi-fi network using NetworkManager. • Awareness of systemd-networkd.

	The following is a partial list of the used files, terms and utilities	• /etc/hostname
		• /etc/hosts
		• /etc/nsswitch.conf
		• /etc/resolv.conf
		• nmcli • hostnamectl
		     • ifup
		     • ifdown

109.3		Basic network troubleshooting
	Weight	4
	Description	Candidates should be able to troubleshoot networking issues on client hosts.
	Key Knowledge Areas	• Manually configure network interfaces, including viewing and changing the configuration of network interfaces using iproute2. • Manually configure routing, including viewing and changing routing tables and setting the default route using iproute2. • Debug problems associated with the network configuration. • Awareness of legacy net-tools commands.

	The following is a partial list of the used files, terms and utilities	• ip
		• hostname
		• ss
		• ping
		• ping6 • traceroute
		    • traceroute6
		    • tracepath
		    • tracepath6 • netcat
		    • ifconfig
		    • netstat
		    • route

109.4		Configure client side DNS
	Weight	2
	Description	Candidates should be able to configure DNS on a client host.
	Key Knowledge Areas	• Query remote DNS servers. • Configure local name resolution and use remote DNS servers. • Modify the order in which name resolution is done. • Debug errors related to name resolution. • Awareness of systemd-resolved.
	The following is a partial list of the used files, terms and utilities	• /etc/hosts • /etc/resolv.conf • /etc/nsswitch.conf • host • dig • getent

Topic 110: Security

110.1		Perform security administration tasks
	Weight	3
	Description	Candidates should know how to review system configuration to ensure host security in accordance with local security policies.
	Key Knowledge Areas	- 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
	Weight	3
	Description	Candidates should know how to set up a basic level of host security.
	Key Knowledge Areas	- 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/	/etc/xinetd.conf - systemd.socket /etc/inittab	/etc/init.d/ /etc/hosts.allow /etc/hosts.deny

110.3		Securing data with encryption
	Weight	4
	Description	The candidate should be able to use public key techniques to secure data and communication.
	Key Knowledge Areas	- Perform basic OpenSSH 2 client configuration and usage. - Understand the role of OpenSSH 2 server host keys. - Perform basic GnuPG configuration, usage and revocation. - Use GPG to encrypt, decrypt, sign and verify files. - Understand SSH port tunnels (including X11 tunnels).

	The following is a partial list of the used files, terms and utilities	- ssh - ssh-keygen - ssh-agent - ssh-add ~/.ssh/id_rsa and id_rsa.pub ~/.ssh/id_dsa and id_dsa.pub ~/.ssh/id_ecdsa and id_ecdsa.pub ~/.ssh/id_ed25519 and id_ed25519.pub /etc/ssh/ssh_host_rsa_key and ssh_host_rsa_key.pub /etc/ssh/ssh_host_dsa_key and ssh_host_dsa_key.pub /etc/ssh/ssh_host_ecdsa_key and ssh_host_ecdsa_key.pub	~/.ssh/authorized_keys - ssh_known_hosts - gpg - gpg-agent ~/.gnupg/

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