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LPIC 1-102 - Linux Server Professional (part 2)

Duration: 4 Days   Course Code: LIN102

Overview:

The Linux Professional Institute (LPI) has established itself as the standard for distribution independent Linux certification. LPI offers three levels of certification: LPI 1, LPI 2 and LPI 3. LPI 1 is the base level certification that is looked for by professionals that want to validate their skills on Linux but not to one specific Linux distribution. This course will help candidates preparing for the LPIC 102 exam, which is the second out of 2 LPI exams candidates have to take to obtain the certificate.

Target Audience:

This course is for IT staff that want to acquire Linux skills. Typical functions for attendees of this course include support staff and junior system administration.

Objectives:

- Shells and Shell Scripting

- Interfaces and Desktops

- Administrative Tasks

- Essential System Services

- Networking Fundamentals

- Security

- **To become LPIC-1 certified the candidate must be able to**:

- understand the architecture of a Linux system;

- install and maintain a Linux workstation, including X11 and setup it up as a network client;

- work at the Linux command line, including common GNU and Unix commands;

- handle files and access permissions as well as system security; and

- perform easy maintenance tasks: help users, add users to a larger system, backup and restore, shutdown and reboot.

Prerequisites:

To attend this course, participants need to attend the LPIC-101 course or have experience at a comparable level.

Testing and Certification

This course prepares for the LPI LPIC-102 (102-500) exam.

Content:

Topic 105: Shells and Shell Scripting

105.1 Customize and use the shell environment

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.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.

107.2 Automate system administration tasks by scheduling jobs

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:

- 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.
- 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.
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- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and

109.1 Fundamentals of internet protocols

Description: Candidates should demonstrate a proper understanding of TCP/IP network fundamentals.

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.
- 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.
- 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.
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- Manage access to the X server and display applications on remote X servers.
- Awareness of Wayland.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- Set the system date and time.
- Set the hardware clock to the correct time in UTC.

- 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.
- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- Audit a system to find files with the suid/sgid

- environment variables.
- 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.
- 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.
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- Knowledge about the differences and major features of UDP, TCP and ICMP.
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- Debug problems associated with the network configuration.
- Awareness of legacy net-tools commands.
- Query remote DNS servers.
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- Configure the correct timezone.
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- Knowledge of using the pool.ntp.org service.
- Awareness of the ntpq command.
- 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.
- Basic CUPS configuration (for local and remote printers).
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- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- Audit a system to find files with the suid/sgid bit set.

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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

105.2 Customize or write simple scripts

Description: Candidates should be able to customize existing scripts, or write simple new Bash scripts.

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.
- 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.
- 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.

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- Debug errors related to name resolution.
- Awareness of systemd-resolved.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

107.3 Localisation and internationalisation

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:

- 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.
- 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.
- 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.

- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

109.2 Persistent network configuration

Description: Candidates should be able to manage the persistent network configuration of a Linux host.

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.
- 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.
- 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.
- Awareness of major desktop environments

- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.

- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- Set the system date and time.
- Set the hardware clock to the correct time in UTC.
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- Configuration of logrotate.
- Awareness of syslog and syslog-ng.
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- Manage user print queues.
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- Add and remove jobs from configured printer queues.
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- 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,

- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
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- 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.
- Basic CUPS configuration (for local and remote printers).
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- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
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- 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.
- Understand basic TCP/IP host configuration.

- Awareness of systemd-networkd.
- 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.
- 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.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

Topic 106: User Interfaces and Desktops

106.1 Install and configure X11

Description: Candidates should be able to install and configure X11.

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.
- Use standard sh syntax (loops, tests).

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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

Topic 108: Essential System Services

108.1 Maintain system time

Description: Candidates should be able to properly maintain the system time and synchronize the clock via NTP.

- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- 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.
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- Basic sudo configuration and usage.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

109.3 Basic network troubleshooting

Description: Candidates should be able to troubleshoot networking issues on client hosts.

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.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- 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.
- Basic CUPS configuration (for local and remote printers).

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.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- Basic configuration of rsyslog.

- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- 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.

- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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.

106.2 Graphical Desktops

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:

- 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.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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

- Determine which users have logged in to the system or are currently logged in.
- Basic sudo configuration and usage.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

108.2 System logging

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:

- 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.
- 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.
- 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.
- Awareness of major desktop

- Understand SSH port tunnels (including X11 tunnels).

109.4 Configure client side DNS

Description: Candidates should be able to configure DNS on a client host.

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.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- Set the system date and time.
- Set the hardware clock to the correct time in UTC.

- chrony.
- Knowledge of using the pool.ntp.org service.
- Awareness of the ntpq command.
- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- 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.

- environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host

- Configure the correct timezone.
- Basic NTP configuration using ntpd and chrony.
- Knowledge of using the pool.ntp.org service.
- Awareness of the ntpq command.
- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- Audit a system to find files with the suid/sgid bit set.

- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

106.3 Accessibility

Description: Demonstrate knowledge and awareness of accessibility technologies.

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.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.

configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- 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.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

108.3 Mail Transfer Agent (MTA) basics

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:

- 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

- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

Topic 110: Security

110.1 Perform security administration tasks

Description: Candidates should know how to review system configuration to ensure host security in accordance with local security policies.

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.
- 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.
- 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.

- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- Manually configure network interfaces, including viewing and changing the configuration of network interfaces using iproute2.
- Manually configure routing, including viewing

- accounts.
- Set command search path with the proper directory.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- 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.

- Manage access to the X server and display applications on remote X servers.
- Awareness of Wayland.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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

- and changing routing tables and setting the default route using iproute2.
- Debug problems associated with the network configuration.
- Awareness of legacy net-tools commands.
- 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.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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:

- 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

Description: Candidates should be able to add, remove, suspend and change user accounts.

Key Knowledge Areas:

- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
- Understand basic TCP/IP host configuration.
- Configure ethernet and wi-fi network using NetworkManager.
- Awareness of systemd-networkd.
- 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.
- Query remote DNS servers.
- Configure local name resolution and use remote DNS servers.
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- Debug errors related to name resolution.
- Awareness of systemd-resolved.
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- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- Perform basic OpenSSH 2 client

- between IPv4 and IPv6.
- Knowledge of the basic features of IPv6.
- Understand basic TCP/IP host configuration.
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- Modify the order in which name resolution is done.
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- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- 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).

110.2 Setup host security

Description: Candidates should know how to set up a basic level of host security.

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 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.
- 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.
- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
- Basic knowledge of assistive technology.
- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
- Create and manage special purpose and limited accounts.
- Manage cron and at jobs.
- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
- Configure timezone settings and environment variables.
- 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.
- 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.

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).

Create e-mail aliases.

Configure e-mail forwarding.

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

108.4 Manage printers and printing

Description: Candidates should be able to manage print queues and user print jobs using CUPS and the LPD compatibility interface.

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.
- 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.
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- Awareness of Wayland.
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- Use command substitution.
- Test return values for success or failure or other information provided by a command.
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- 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.
- Awareness of major desktop environments
- Awareness of protocols to access remote desktop sessions
- Basic knowledge of visual settings and themes.
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- Add, modify and remove users and groups.
- Manage user/group info in password/group databases.
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- Configure user access to cron and at services.
- Understand systemd timer units.
- Configure locale settings and environment variables.
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- Knowledge of using the pool.ntp.org service.
- Awareness of the ntpq command.
- 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

- 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.
- Basic CUPS configuration (for local and remote printers).
- Manage user print queues.
- Troubleshoot general printing problems.
- Add and remove jobs from configured printer queues.
- 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.
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- Debug problems associated with the network configuration.
- Awareness of legacy net-tools commands.
- 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.
- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- Perform basic OpenSSH 2 client configuration and usage.

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- 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.
- Awareness of shadow passwords and how they work.
- Turn off network services not in use.
- Understand the role of TCP wrappers.
- Perform basic OpenSSH 2 client configuration and usage.
- Understand the role of OpenSSH 2 server host keys.
- Perform basic GnuPG configuration, usage

- Understand the role of OpenSSH 2 server host keys.
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- Use GPG to encrypt, decrypt, sign and verify files.
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- Perform basic GnuPG configuration, usage and revocation.
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- Understand SSH port tunnels (including X11 tunnels).

Topic 109: Networking Fundamentals

and revocation.
- Use GPG to encrypt, decrypt, sign and verify files.
- Understand SSH port tunnels (including X11 tunnels).

110.3 Securing data with encryption

Description: The candidate should be able to use public key techniques to secure data and communication.

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.
- 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.
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- environment variables.
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- Basic NTP configuration using ntpd and chrony.
- Knowledge of using the pool.ntp.org service.
- Awareness of the ntpq command.
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- Filter systemd journal data by criteria such as date, service or priority.
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- Use GPG to encrypt, decrypt, sign and verify files.
- Understand SSH port tunnels (including X11 tunnels).

Further Information:

For More information, or to book your course, please call us on 00 971 4 446 4987

training@globalknowledge.ae

www.globalknowledge.com/en-ae/

Global Knowledge, Dubai Knowledge Village, Block 2A,First Floor, Office F68, Dubai, UAE