

# Linux and Unix Fundamentals

## Synopsis

This course is a practical introduction to Unix and Linux, taught through their most popular incarnation: GNU/Linux.

The course covers the basics of Linux administration topics which are relevant in the jobs these days. It can be used as a basis for the preparation for many certifications in Linux Administration.

This course focuses on the underlying principles of Unix and Linux in a system-independent way, ensuring that delegates learn the core concepts, which apply throughout Unix and are present in all versions of Linux, no matter who the vendor may be (e.g. MX Linux, CentOS, Manjaro, Mandriva, PC Linux OS, Slackware, UnitedLinux, Red Hat, SuSE, Debian Linux, Mandrake, Sun Solaris and Linux, BSD Unix, FreeBSD, NetBSD, OpenBSD, AIX, HP-UX, Tru64 Unix, etc.)

At the end of the course delegates will be well-positioned to become serious users, software developers and administrators of any Linux system and will fully understand the application of Linux in serious commercial and other environments.

## Suitable for

Experienced computer users who are relatively new to Unix or Linux and need to master a Unix/Linux system quickly and effectively. e.g. former MacOS or Microsoft Windows users.

Linux and Unix users or administrators who want to become Linux certified.

Linux and Unix users who need to consolidate and advance basic knowledge that they have picked up in an ad hoc fashion.

Linux and Unix users taking their first steps into professional Unix/Linux system administration, Unix/Linux network administration or Unix/Linux programming.

## **Prerequisites**

Advanced computer literacy

Basic understanding of TCP/IP networking concepts

A minimum of three months' practical experience using Linux or Unix

A willingness to learn and use command line applications

A commitment to further practice and exam preparation if LPI certification is your goal

## **Delivery**

The course is available via classroom, online, and distance learning formats.

The assessments are available in a physical lab, online and via distance learning.

Certificates are available online. Printed certificates can be mailed to the customer.

# Topics

## Introduction

What Linux is, Unix philosophy

Logging in, typing commands, logging out

Files, directories and paths

Creating files with a text editor

Viewing files (cat, less)

Managing files (cp, mv, rm)

Magic dot files and hidden files

Managing directories (mkdir, rmdir)

Documentation for commands (man)

Useful shell features (command-line editing, command line completion, history)

## The Unix and Linux command line

Unix shells (bash)

Command line syntax (options, arguments)

Shell variables and environment variables

Command substitution

Using pipes to connect programs

Useful text filters (wc, sort, uniq, expand, head, tail, nl, tac)

Spitting files across disks (split)

Using redirection to connect programs to files

Redirect into files with append (>>)

## **Regular expression searches**

Searching files with regular expressions (grep)

The concept of 'pattern matching' with regular expressions

Anchor the pattern to the start of end of the line (^, \$)

Match repeated patterns (\*, \+, ?)

Escaping special characters in regexps (\)

Matching any character (.)

Matching alternative patterns (|)

Simple use of sed to 'search and replace'

## **Documentation**

The unfortunate diversity of Linux documentation

Using man(1)

How manpages are divided among 'sections'

Searching for man pages (apropos, man -k)

Printing man pages (man -t)

Documentation for shell builtins (help)

Using GNU info documentation (info)

Documentation under /usr/share/doc

## **Text editing with Vi**

Unix is all about text

Vi: the standard Unix editor

The concept of 'modes' in a modal editor

Vi clones, extensions to vi

Other powerful Unix text editors

Practical work learning Vi and Vim

## **Processes and jobs**

What processes are

The properties of a process

Parent processes and child processes

Job control (fg, bg, jobs)

Suspending processes (Ctrl+Z)

Running programs in the background (&)

Long-lived processes (nohup)

Monitoring processes (ps, pstree, top)

Killing processes and sending signals a process (kill, killall, xkill)

Process niceness/priority (nice, renice)

## **Filesystem concepts and use**

The unified Unix filesystem

Special file types

Symbolic links (ln -s)

Inodes and directory entries

Hard links

Preserving links while copying and archiving

Where to put things: the FHS

## **Filesystem security**

Users and groups

The 'root' user, or superuser

Changing file ownership (chown)

Changing file group ownership (chgrp)

More complex ways of changing ownership (recursively, changing owner and group simultaneously)

Permissions on files

Permissions on directories

How permissions are applied

Changing permissions (chmod)

The special 'sticky bit' mode on directories

Setgid and setuid permissions, their effect on files and directories

Default permissions for new files (umask)

## **Filesystem design and maintenance**

Disks, partitions, individual filesystems and filesystem types

Naming of disk and partition devices (/dev/hda, etc)

Creating and deleting partitions (fdisk)

Mounting and unmounting filesystems (mount, umount)

Checking available free space and space used by files (df, du)

Checking and correcting the integrity of filesystems (fsck)

Journaling filesystems, converting from ext2 to ext3

## **Bootting and runlevels**

The boot process: from BIOS to kernel to userspace

Setting kernel parameters

Configuring a boot loader: LILO and Grub

Runlevels and init scripts

Configuring services to run at boot

Securing single-user mode (sulogin)

Shutting down and rebooting the system

## **Managing user accounts and configuration files**

Configuration files

Environment variables for configuration (PATH, PS1, DISPLAY, http\_proxy)

Setting and examining shell aliases

Configuring the readline library (inputrc files)

User database files (/etc/passwd, /etc/group, etc)

Changing passwords (passwd)

Adding users (useradd, adduser)

Deleting and modifying user accounts (userdel, usermod)

Locking and unlocking user accounts

## **Scheduling, logging and backup**

Running commands at particular times (at, atq, atrm)

Scheduling commands to run repeatedly (cron)

Different ways of configuring cron (/etc/crontab, etc)

User crontabs (crontab command)

Configuring logging (syslog, /etc/syslog.conf)

Examining logs (less, grep, tail -f)

Log rotation (logrotate)

Backup strategy and media

Using tar to make, examine and extract archives

Accessing tape drives, using tar with tapes

## **Installing software**

Managing software installation (advantages of package management)

Debian package management:

- Package naming and version numbering
- Searching for packages (apt-cache)
- Using Apt to get and install packages (apt-get)
- Low-level package management (dpkg)

Red Hat package management:

- Installing and upgrading RPM packages (rpm)
- Which packages are installed, which package a file came from
- Examining RPM package files
- Verifying integrity of the installation

Compiling and installing software from source code (./configure, make, etc)

Managing shared libraries (ldd, ldconfig)

## **The Linux kernel**

What the kernel is and does

Kernel modules (lsmod, modprobe, rmmod)

Module dependencies (depmod)

Examining modules (modinfo)

Configuring kernel modules (/etc/modules.conf)

Recompiling the kernel

Configuring, compiling and installing the kernel and modules (make menuconfig, make xconfig, etc)

Loading and unloading kernel modules (lsmod, modprobe, rmmod)

## **The X window system**

What X is

The role of window managers and desktop environments

Startup and session scripts

Terminal emulators (xterm, etc)



## **Advanced shell usage**

Quoting (single quotes, double quotes, backslashes)

Combining quoting mechanisms

Globbering patterns (\*, ?, [])

Generating filenames and other text with {} braces

## **Shell scripting and configuration**

The point of shell programming

The 'she-bang line' (#!/bin/sh)

Outputting text with (echo)

Reading input (read)

Writing simple shell functions

Sourcing files

Command substitution again

Conditional execution (||, &&, if, else)

Looping (for, while, seq)

Infinite loops (while true)

Testing for the existence and type of files (-f, -d, etc)

Sending email from scripts (mail)

## **TCP/IP networking configuration**

Overview of modern TCP/IP networking, rôles of IP, TCP, UDP and ICMP

Domain names and IP addresses (host, dig)

Port numbers (/etc/services)

Network interfaces (ifconfig, ifup, ifdown)

Kernel routing tables (route)

Finding and setting the hostname (hostname, /etc/hostname)

DHCP client hosts

Network diagnostics (ping, traceroute, netstat)

## **Linux network services**

Overview of network services under Linux, operating daemons

Sending signals to daemons

The advantages and disadvantages of using Inetd and Xinetd, basic configuration of both

## **DNS and email services**

Configuring the resolver libraries

Structure of domain names, registering names (whois)

Running a DNS server (BIND), setting up a caching-only name server

Running an MTA (email server)

Email clients (MUAs)

Basic configuration of Exim

Routing mail with MX (mail exchanger) DNS records

## **Basic configuration of Apache**

Running a webserver (Apache)

Configuration files for Apache

Named virtual hosts

Options available for dynamic pages

Logging in Apache

## **Networked filesystems**

Configuring NFS (/etc/exports, /etc/fstab)

Basic Samba configuration (smb.conf)

## Trainer :

Khawar Nehal

Mr. Khawar has been using and teaching Linux administration for almost three decades since 1993 and Unix since 1991. Started using computers 42 years ago in 1980. Has been in the field of computers actively for the past 38 years since 1984. Has trained over 10,000 students in subjects related to ICT, Energy and Management.

## Terms and conditions

Assessment and certification : PKR 10,000 per hour.

One on one online teacher support : PKR 4,000 per hour.

Group classroom online teacher support : PKR 10,000 per hour.

Support via email, whatsapp, telegram and signal : Rs 1,000 per query.

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