Level 5 Diploma in Unix Networking (189) 149 Credits

Unit: Unix Performance Management **Exam Paper No.:** 1	**Guided Learning Hours:** 240 **Number of Credits:** 24
Prerequisites: Knowledge in Unix operating system commands.	**Corequisites:** A pass or higher in Certificate in Unix Networking or equivalence.
Aim: As the first Paper in the Diploma in Unix Networking, this unit familiarises learners with the different Unix environments and covers the basics of System Administration and user management. This is an intermediate level on the internal operations and fundamental principles of modern operating systems. Specifically, this unit will cover core concepts such as processes and threads, deadlocks, memory management, and file systems. The unit will concentrate on "Background information" - what happens behind the scenes on a Unix system. It covers what the filesystem is, how it's structured, and various concepts involved, such as symbolic links; mounting volumes and files. One of the brilliant design moves of the UNIX operating system is that everything on a system is represented as a file. A hard disk is a file, a terminal is a file, your webcam is a file - everything. Other topics include: Basic concepts, system calls, relative paths, permissions, symbolic links, commonly used devices, anatomy of a filesystem, virtual filesystems; processes and threads: interprocess communication, scheduling; deadlocks: detection, recovery, avoidance, prevention; memory management: swapping, virtual memory, replacement algorithms, segmentation; input/output: disks, clocks, character-oriented terminals, graphical user interfaces, power management; file systems: directories, file system implementation, examples; security: cryptography basics, authentication, attacks, protection mechanisms, trusted systems; case study: Unix, Linux and Windows: overview, processes, memory management, I/O, file system, security.	
Required Materials: Recommended Learning Resources.	**Supplementary Materials:** Lecture notes and tutor extra reading recommendations.
Special Requirements: The unit requires a combination of lectures, demonstrations, discussions, and hands-on labs.	

Intended Learning Outcomes:	**Assessment Criteria:**
1. Why monitoring system resources is of major concern to the system administrator in analysing resource utilisation and constraints.	1.1 Analyse functionality and performance metrics 1.2 Identify system resources and their metrics 1.3 Identify system design techniques 1.4 Describe multiplexing 1.5 Distinguish pipelining and parallelism
2. The process of system performance analysis in measuring, evaluating, and understanding system performance.	2.1 Outline performance analysis steps 2.2 Describe the process of interpreting and present results 2.3 Describe Operating System and process monitoring tools 2.4 Explain the importance of monitoring Unix processes for their availability and performance
3. Kernel 'command-line options', 'boot time parameters' and configuring UNIX Kernel Parameters.	3.1 Describe kernel configuration and organisation 3.2 Outline the context of a process 3.3 Describe signalling 3.4 Explain Unix system entry configurations 3.5 Explain the run-time organisation 3.6 Describe shared data security in network system

	3.7 Identify Unix kernel properties
4. Process-scheduling algorithms and how the process scheduler keeps the CPU busy by allocating it to the highest priority process.	4.1 Analyse process priority scheduling 4.2 Describe how the system calculates priority 4.3 Describe priority problems 4.4 Define priority inversion
5. The functions, tasks of the threads and how the system supports a single or multi-user process.	5.1 Define a thread 5.2 Describe advantages of threads 5.3 Explain thread implementation 5.4 Describe multiprocess synchronisation issues 5.5 Define recursive lock
6. The functions of the I/O system and how it hides the details in the different hardware units from the main part of the kernel.	6.1 Describe the importance of I/O system 6.2 Describe Unix device types 6.3 Describe functions and components of device driver 6.4 Analyse the device/driver association
7. How Unix sockets use inter-process-communication mechanism to allow bidirectional data exchange between processes.	7.1 Define a socket 7.2 Outline the TCP socket data and control flows 7.3 Describe the purpose of UNIX domain sockets 7.4 Explain the principles of Unix Domain Socket and how it works
8. How Remote Procedure Call (RPC) techniques are used for constructing distributed, client-server.	8.1 Describe the client/server model mechanism 8.2 Describe procedure call parameter passing 8.3 Describe RPC problems 8.4 Define dynamic binding 8.5 Describe RPC semantics and failures 8.6 Identify RPC implementation issues
9. Benchmarking as a technique for solving system communication, Unix system monitoring tools and performance monitor.	9.1 Describe the purpose of performance benchmarking 9.2 Outline performance benchmarking approaches 9.3 Describe the Unix file system (UFS) 9.4 Explain how Unix divides physical disks into logical disks. 9.5 Describe file system interface 9.6 Describe file system consistency approaches 9.7 Describe memory based file system 9.8 Describe log-structure file system
10. Distributed File Systems (DFSs); the need to share network resources; Unix virtual memory system; the memory management unit and paging as one of the memory-management schemes.	10.1 Define remote file system and Andrew file system 10.2 Describe the goals of NFS 10.3 Outline the operations and structure of NFS 10.4 Describe NFS protocol 10.5 Analyse NFS implementation techniques 10.6 Describe NFS security issues

	10.7 Analyse the purpose of virtual management 10.8 Analyse and explain the memory-mapped file approach 10.9 Describe the relationship between file and virtual memory subsystems 10.10 Describe Distributed Computing Environment (DCE) tools used for developing and deploying multi-platform, secure, enterprise-wide distributed systems 10.11 Identify the different forms of shared memory 10.12 Describe clock synchronisation 10.13 Define atomic transaction
Methods of Evaluation: A 2½-hour written examination paper with five essay questions, each carrying 20 marks. Candidates are required to answer all questions. Candidates also undertake project/coursework in Unix Performance Management with a weighting of 100%.	

Recommended Learning Resources: Unix Performance Management

Text Books	• System Files and Devices Reference Manual by Motorola/UNIX System Labs ISBN-10: 0130358746 • Unix File System ISBN-10: 6133569204 • BSD, Including: SunOS, 386bsd, NeXTSTEP, Darwin (Operating System), OpenStep, Ultrix, Unix File System, Coherent (Operating System), V by Hephaestus Books ISBN-10: 1242974385
Study Manuals 	BCE produced study packs
CD ROM 	Power-point slides
Software 	Unix Operating System