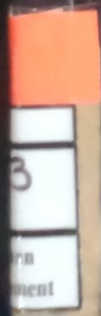


Operating Systems incorporating UNIX & Windows

3rd edition

Colin Ritchie



Contents

Preface	v
1 Background	1
1.1 What is an Operating System?	1
1.2 History and Evolution	1
Program Loading – Bootstrapping	
Early Printers and Terminals	
The Era of the Punched Card	
Getting Faster	
Re-inventing the Wheel	
New Peripherals	
New Software	
New Ideas	
Putting It All Together	
Single Stream Batch Processing	
Multiprogramming	
Spooling	
Real Time Systems	
Conclusion	
1.3 An Introduction to UNIX and MS-DOS	9
A Brief History of UNIX	
Other UNIX Standards and Versions	
Summary of UNIX features	
A Brief History of MS-DOS	
Summary of Main Features of MS-DOS	
A Brief History of Windows Systems	
Summary of Windows Features	
Summary of Important Terms	
Additional Reading	
Review Questions	
Test Questions	
2 Basics	17
2.1 Introduction	17
2.2 Overview of Operating System	17
2.3 The 'Process' Concept	18
Process Creation and States	
Kernel Mode	
2.4 Hardware Features	20
Introduction	
General Machine Structure	
Interrupt System	
DMA	
Memory Addressability	
Memory Relocation	

Relocating Loader	
Relocation Register	28
2.5 Introduction to Object Orientation	
Objects	
Classes	
Inheritance	
Object Orientation in Practice	
Summary of Important Terms	
Review Questions	
Test Questions	32
3 User Interface	32
3.1 Outline	
Introduction	
Classes of User	
Types of Interface	
Summary	36
3.2 System Calls	
General	
UNIX	
MS-DOS	
NT System Interface	
3.3 Command Languages	40
General	
UNIX Command System	
Perl	
MS-DOS Commands	
Windows 95 and NT Commands	
3.4 Job Control Languages	44
3.5 Graphical User Interfaces	45
General	
X Windows	
PC-Based Window Systems	
Appraisal of GUIs	
3.6 System Properties Management	54
Summary of Important Terms	
Additional Reading	
Review Questions	
Test Questions	
4 Process Management	
4.1 Basic Concepts	56
4.2 Process Life Cycle	58
Overview	
Process Creation	
Process State Diagrams	
Threads	

4.3 Scheduling	64
Objectives of Scheduling	
Criteria for Scheduling	
High Level Scheduling	
Medium Level Scheduling	
Low Level Scheduling	
4.4 Processes in UNIX	72
Process Creation	
UNIX System V, Version 4	
Other Process Facilities	
4.5 Processes in Windows	77
Summary of Important Terms	
Review Questions	
Test Questions	
5 Memory Management 1	80
5.1 Introduction	80
Process Loading and Swapping	
5.2 Memory Allocation Methods	82
Introduction	
Single Process System	
Fixed Partition Memory	
Variable Partition Memory	
Variable Partition Allocation with Compaction	
Simple Paging	
Simple Segmentation	
Review Questions	
Test Questions	
6 Memory Management 2	96
6.1 Virtual Memory	96
Mechanics of Virtual Memory	
Additional Techniques	
6.2 Virtual Segmented Systems	106
Combined Paging and Segmentation	
6.3 Virtual Machines	109
Review Questions	
Test Questions	
7 Memory Management 3	112
7.1 Protection and Sharing	112
Introduction	
Limit Registers	
Paging Systems	
Segmentation	
7.2 MS-DOS Memory Management	114
Basic Principles	
Overlaying	
Extended and Expanded Memory	

MS-DOS Memory Allocation	
Windows Memory Management	121
7.3 UNIX Memory Management	
Memory Model	
Swapping	
Paging Systems	122
7.4 Summary	
Review Questions	
Test Questions	125
8 Input-Output	125
8.1 Organisation of I/O Software and Hardware	
Revision	
Objectives of I/O System	
Structure of I/O System	132
8.2 UNIX I/O System	
Device Drivers in UNIX	
Terminals	134
8.3 MS-DOS I/O System	
Standard Devices	
Device Drivers in MS-DOS	
Device Drivers in Window Systems	
Summary	
Review Questions	
Test Questions	138
9 File Management 1	138
9.1 General Principles	
Background	
File Types	
File Identification	
Directories	
Paths and Pathnames	
Alias Filenames	
Volume Concept	
9.2 System Services	146
On-line Facilities	
Programming Services	
Summary	
Additional Reading	
Review Questions	
Test Questions	
10 File Management 2	149
10.1 File Management Techniques	149
Allocation of File Space	
MS-DOS File System and Allocation Method	
UNIX File System and Allocation Method	
Windows File Systems	

10.2 Improving the Performance of Disk Systems	163
Blocking	
Disk Caching	
RAM Disk	
File Re-organisation	
Summary	
Additional Reading	
Review Questions	
Test Questions	
11 Concurrent Processes 1	167
11.1 Basic Principles	167
Overview	
Resources	
Interprocess Communication	
11.2 Competing Processes	169
Identifying the Problem	
Achieving Mutual Exclusion	
Semaphores	
File and Record Locking	
11.3 UNIX Features	179
Semaphores in UNIX	
Record Locking	
Summary	
Review Questions	
Test Questions	
12 Concurrent Processes 2	181
12.1 Deadlocks	181
Deadlock Examples	
Conditions for Deadlock	
Dealing with Deadlocks	
Deadlock Prevention	
Deadlock Avoidance	
Deadlock Detection	
Summary	
12.2 Interprocess Communication	189
Signals	
Pipes	
Message Passing	
Shared Memory	
Windows DDE and OLE	
Review of Interprocess Communication	
Summary	
Additional Reading	
Review Questions	
Test Questions	

Answers to selected test questions	199
13 Networks and Distributed Systems	199
13.1 Introduction	199
13.2 Networks	
Communication Methods	
Types of Networks	
Motivation for Networks	
Servers	
Network Standards	211
13.3 The Internet and World Wide Web	
Internet Basics	
World Wide Web	217
13.4 Distributed Systems	
CORBA	
Distributed Computing Environment (DCE)	
Distributed Common Object Model (DCOM)	
Distributed System Object Model (DSOM)	
Distributed Application Integration System (DAIS)	
Summary	
Additional Reading	
Review Questions	
Test Questions	
14 Security	222
14.1 Introduction	222
14.2 Security – the Nature of the Threats	222
14.3 Security Techniques	226
Procedural Guards	
Operating System Facilities	
Encryption	
Summary	
Additional Reading	
Review Questions	
Test Questions	
Appendix A – Introduction to the UNIX Shell	233
Appendix B – Summary of MS-DOS Commands	255
Answers to Review Questions	257
Answers to Selected Test Questions	264
Web References	270
Bibliography	272
Index	274