
Contents

Preface	VII
List of Figures	XIII
List of Tables	XV
1 Introduction	1
1.1 Quality of Service	3
1.2 Network Utilisation	5
1.3 Traffic Management	10
1.4 Queue Analysis	12
1.5 Summary	17
2 Fundamentals of the J Programming Language	19
2.1 Data Objects	19
2.2 J Verbs	21
2.3 Monadic and Dyadic functions	22
2.4 Positional Parameters	23
2.5 Adverbs	27
2.6 Rank, Shape and Arrays	28
2.7 Summary	32

3	Programming in J	33
3.1	Verb Composition	35
3.1.1	Hooks	35
3.1.2	Forks	36
3.1.3	Longer Phrases	36
3.1.4	Conjunctions	37
3.2	Examples	41
3.2.1	More z -transforms	42
3.2.2	Shannon's Result	43
3.2.3	Euler's Formula	43
3.2.4	Information Entropy	44
3.3	Good Programming Practice	45
3.3.1	Locales	47
3.3.2	Explicit Programming	48
3.4	Scripts	49
3.5	Summary	50
4	Network Calculus	51
4.1	Characterising Traffic Flows	51
4.2	Min-Plus Algebra	54
4.3	Mathematical Background	58
4.3.1	Wide-Sense Increasing	59
4.3.2	Types of Wide-Sense Increasing Functions	59
4.3.3	Subadditive Functions	62
4.3.4	Subadditive Closure	63
4.3.5	Concavity and Convexity	64
4.3.6	Star Shaped Functions	65
4.4	Arrival Curves	66
4.5	Service Curves	71
4.5.1	Concatenation	71
4.5.2	Performance Bounds	72
4.6	Streaming Video Example	74
4.7	Effective Bandwidth and Equivalent Capacity	78
4.8	Summary	81

5	Stochastic Processes and Statistical Methods	83
5.1	Random Number Generators	83
5.2	Statistical Functions	87
5.2.1	Autocovariance and Autocorrelation	88
5.2.2	Variance Time Plot	90
5.2.3	Fourier Transform and Power Spectrum	92
5.3	Stochastic Processes	95
5.3.1	Autoregressive Processes	96
5.3.2	Moving Average Processes	99
5.3.3	Processes with Long-Memory	100
5.4	Queue Analysis	104
5.5	Summary	108
6	Traffic Modeling and Simulation	109
6.1	On/Off Traffic Sources	109
6.2	Binomial Distribution	110
6.3	Markov Models	112
6.4	Effective Bandwidth	115
6.5	Discrete On/Off Source Models	120
6.6	Summary	124
7	Chaotic Maps	125
7.1	Analysing Chaotic Behaviour	125
7.2	Chaotic Maps for Traffic Sources	134
7.2.1	Bernoulli Shift	136
7.2.2	Double Intermittency Map	140
7.2.3	Queue Dynamics	144
7.3	Summary	145
8	ATM Quality of Service	147
8.1	Generic Cell Rate Algorithm	148
8.2	Virtual Scheduling Algorithm and Leaky Bucket Algorithm	148
8.2.1	Jitter	152
8.3	Dual Virtual Scheduling Algorithm and Dual Leaky Bucket	153
8.4	Analysing Burst Tolerance	155
8.5	Summary	161

9 Congestion Control	163
9.1 A Simple Congestion Control Algorithm	164
9.2 Binomial Congestion Control Algorithms	166
9.2.1 Analysis	171
9.3 Model of TCP Congestion Control	176
9.3.1 Analysis	179
9.4 Summary	181
Scripts	183
A.1 Scripts from Chapter 3	183
A.2 Scripts from Chapter 4	185
A.3 Scripts from Chapter 5	187
A.4 Scripts from Chapter 6	193
A.5 Scripts from Chapter 7	196
A.6 Scripts from Chapter 8	198
A.7 Scripts from Chapter 9	200
Abbreviations	205
References	207
Index	211



<http://www.springer.com/978-1-84628-822-7>

Network Performance Analysis
Using the J Programming Language

Holt, A.

2008, XVI, 216 p., Hardcover

ISBN: 978-1-84628-822-7