

Table of Contents

<i>Preface</i>	xv
I: A Tutorial	1
1: Introduction	3
1.1 MUA Versus MTA	4
1.2 Why Is sendmail So Complex?	4
1.3 Three Important Parts	5
1.4 Run sendmail by Hand	6
1.5 The Header	8
1.6 The Body	8
1.7 The Envelope	9
1.8 Things to Try	10
2: Have a V8	13
2.1 Get the Source	13
2.2 Read the Documents	14
2.3 What's What in src	15
2.4 Preliminaries	16
2.5 Build	19
2.6 Test It	20
2.7 Things to Try	21

3:	<i>The Roles of sendmail</i>	23
3.1	Role in the Filesystem	23
3.2	Role in Local Delivery	27
3.3	Role in Network Transport	29
3.4	Role as a Daemon	30
3.5	Things to Try	31
4:	<i>How to Run sendmail</i>	33
4.1	Become a Mode (-b)	34
4.2	Verbose (-v)	39
4.3	Debugging (-d)	43
4.4	Things to Try	44
5:	<i>The sendmail.cf File</i>	47
5.1	Overview	47
5.2	The Minimal File	49
5.3	A Quick Tour	50
5.4	Things to Try	55
6:	<i>The Mail Hub and Delivery Agents</i>	57
6.1	The client.cf File	59
6.2	Define a Mail Delivery Agent	59
6.3	The local Delivery Agent	61
6.4	Add the Missing Parts to Mhub	66
6.5	Things to Try	67
7:	<i>Macros</i>	69
7.1	Overview	69
7.2	Defining Macros	71
7.3	Predefined Macros	72
7.4	Things to Try	75
8:	<i>Addresses and Rules</i>	77
8.1	A Fictional Network	77
8.2	Why Rules?	81
8.3	Rule Sets	83
8.4	Rules	85
8.5	The Workspace	86
8.6	The Flow of Addresses Through Rules	87

8.7	Wildcard Operators	89
8.8	Things to Try	94
9:	Rule Set 0	95
9.1	Introducing Rule Set 0	96
9.2	The RHS Triple	96
9.3	Testing Rule Set 0	99
9.4	The error Delivery Agent	100
9.5	Things to Try	101
10:	Rule Set 3	103
10.1	Why Preprocess?	104
10.2	Rule Set 3	105
10.3	Missing Addresses	108
10.4	Nested Angle Brackets	109
10.5	Details of Rule Flow	111
10.6	Things to Try	113
11:	Rule Sets 1 and S=	115
11.1	Flow of the Sender's Address	115
11.2	Rule Set S=	116
11.3	All Mail from the Hub	117
11.4	Rule Set Hubset	117
11.5	Testing So Far	120
11.6	Handling user@thishost	121
11.7	Rule Set 1	123
11.8	Things to Try	124
12:	Class	127
12.1	The Class Command	128
12.2	The File Form of Class	135
12.3	Things to Try	138
13:	Setting Options	139
13.1	Options: An Overview	139
13.2	Required Options	140
13.3	Testing the Options	146
13.4	Sending Mail	147
13.5	Things to Try	148

14: Headers, Precedence, and Trust	149
14.1 Headers	149
14.2 Headers Versus Delivery Agent Flags	153
14.3 Headers Learned So Far	155
14.4 Precedence	156
14.5 Sending Real Mail	157
14.6 Trusted User	158
14.7 Things to Try	159
15: Install and Test the client.cf File	161
15.1 Test the Configuration File	161
15.2 The Real Queue Directory	163
15.3 MX Records	164
15.4 Hub Accepts Mail for Client	166
15.5 Prevent the Daemon from Running	169
15.6 Install the client.cf File	170
15.7 Things to Try	171
16: The null.mc File and m4	173
16.1 The cf/cf Directory	173
16.2 The null.mc File	174
16.3 Run m4	175
16.4 Test the Result	176
16.5 Qualify All Addresses?	177
16.6 Things to Try	178
17: The Hub's Complex Rules	179
17.1 Rule Set 3	180
17.2 Rule Set 96	185
17.3 Rule Set 0	187
17.4 Rule Set 4	188
17.5 Things to Try	189
II: Build and Install	191
18: Compile and Install sendmail	193
18.1 To Use or Not to Use	193
18.2 Vendor Versus Compiling	194
18.3 Obtain the Source	195

18.4	Tuning Makefile	198
18.5	Run Make	203
18.6	Install sendmail	204
18.7	Pitfalls	205
18.8	Alphabetized Reference	206
19:	<i>V8 m4 Configuration</i>	241
19.1	The m4 Preprocessor	241
19.2	Build with m4	244
19.3	The Minimal mc File	246
19.4	m4 Macros by Function	251
19.5	Pitfalls	256
19.6	Alphabetized m4 Macros	256
20:	<i>The checkcompat() Cookbook</i>	285
20.1	How checkcompat() Works	286
20.2	The Cookbook	288
20.3	Alphabetized V8.8 Subroutines	297
III:	<i>Administration</i>	303
21:	<i>DNS and sendmail</i>	305
21.1	Overview	305
21.2	How sendmail Uses DNS	309
21.3	Set Up MX Records	314
21.4	How to Use nslookup	320
21.5	Prepare for Disaster	322
21.6	Pitfalls	326
22:	<i>Security</i>	327
22.1	Why root?	327
22.2	The Environment	329
22.3	SMTP Probes	330
22.4	The Configuration File	333
22.5	Permissions	338
22.6	The Aliases File	343
22.7	Forged Mail	344
22.8	Security Features	347
22.9	Pitfalls	355

23: <i>The Queue</i>	357
23.1 Overview of the Queue	358
23.2 Parts of a Queued Message	359
23.3 A Bogus qf File (V8 only): Qf	364
23.4 Printing the Queue	366
23.5 How the Queue Is Processed	369
23.6 Cause the Queue to Be Processed	371
23.7 Process Alternate Queues	376
23.8 Pitfalls	378
23.9 The qf File Internals	379
24: <i>Aliases</i>	393
24.1 The aliases(5) File	393
24.2 Forms of Alias Delivery	397
24.3 Write a Delivery Agent Script	402
24.4 Special Aliases	404
24.5 The Aliases Database	408
24.6 Prevent Aliasing with -n	411
24.7 Pitfalls	413
25: <i>Mailing Lists and ~/.forward</i>	415
25.1 Internal Mailing Lists	415
25.2 :include: Mailing Lists	416
25.3 Defining a Mailing List Owner	420
25.4 Exploder Mailing Lists	421
25.5 Problems with Mailing Lists	422
25.6 Packages That Help	425
25.7 The User's ~/.forward File	426
25.8 Pitfalls	432
26: <i>Logging and Statistics</i>	435
26.1 Logging with syslog	435
26.2 Statistics	446
26.3 Signaling the Daemon	449
26.4 Log Transactions with -X	453
26.5 Pitfalls	454

IV: Reference	457
27: The Configuration File	459
27.1 Overall Syntax	460
27.2 Comments	461
27.3 V8 Comments	461
27.4 Continuation Lines	462
27.5 The V Configuration Command	462
27.6 Pitfalls	464
28: Rules	465
28.1 Overview	465
28.2 Tokenizing Rules	469
28.3 The Workspace	472
28.4 The Behavior of a Rule	472
28.5 The LHS	473
28.6 The RHS	475
28.7 Pitfalls	486
29: Rule Sets	487
29.1 The S Configuration Command	487
29.2 Rule Sets and m4	492
29.3 The Sequence of Rule Sets	494
29.4 Rule Set 3	496
29.5 Rule Set 4	500
29.6 Rule Set 0	501
29.7 Rule Set 5	505
29.8 Rule Set 2	506
29.9 Rule Set 1	507
29.10 The check_... Rule Sets	507
29.11 Pitfalls	513
30: Delivery Agents	515
30.1 Configuration File Syntax	515
30.2 The Symbolic Name	516
30.3 m4 Configuration Syntax	517
30.4 The Equates	519
30.5 Internally Defined Names	538
30.6 How Executed	542

30.7	Pitfalls	544
30.8	Alphabetized F= Flags	545
31:	<i>Defined Macros</i>	569
31.1	Preassigned Macros	570
31.2	Command-Line Definitions	570
31.3	Configuration File Definitions	572
31.4	Macro Names	574
31.5	Macro Expansion: \$ and \$\$	576
31.6	Macro Conditionals: \$?, \$!, and \$..	580
31.7	Categories of Macros	581
31.8	Macros with the m4 Technique	582
31.9	Pitfalls	583
31.10	Alphabetized Reference	584
32:	<i>Class Macros</i>	609
32.1	Class Configuration Commands	609
32.2	Access Class in Rules	613
32.3	Class with m4	617
32.4	Pitfalls	618
32.5	Alphabetized Reference	619
33:	<i>Database Macros</i>	625
33.1	Enable at Compile Time	626
33.2	Create Files with makemap	627
33.3	The K Configuration Command	630
33.4	Use Maps with \$(and \$) in Rules	638
33.5	The User Database	642
33.6	Database Maps and m4	645
33.7	Pitfalls	646
33.8	Alphabetized Reference	647
34:	<i>Options</i>	663
34.1	Command-Line Options	664
34.2	Configuration-File Options	667
34.3	Configuring with V8 m4 Options	668
34.4	Alphabetical Table of All Options	671
34.5	Option Argument Types	673
34.6	Interrelating Options	676

34.7 Pitfalls	679
34.8 Alphabetized Reference	680
35: Headers	773
35.1 The H Configuration Command	773
35.2 Header Names	775
35.3 Header Field Contents	776
35.4 ?flags? in Header Definitions	780
35.5 Header Behavior in conf.c	781
35.6 Headers by Category	784
35.7 Forwarding with Resent-Headers	788
35.8 Precedence	790
35.9 Pitfalls	791
35.10 Alphabetized Reference	792
36: The Command Line	811
36.1 Alternative argv[0] Names	811
36.2 Command-Line Switches	815
36.3 List of Recipient Addresses	817
36.4 Processing the Command Line	817
36.5 sendmail's exit() Status	819
36.6 Pitfalls	827
36.7 Alphabetized Reference	828
37: Debugging with -d	845
37.1 The Syntax of -d	845
37.2 Debugging Behavior	847
37.3 Interpreting the Output	847
37.4 Pitfalls	850
37.5 Reference in Numerical Order	850
38: Rule-Set Testing with -bt	949
38.1 Overview	949
38.2 Configuration Lines	951
38.3 Dump a Macro	953
38.4 Show an Item	955
38.5 Complex Actions Made Simple	957
38.6 Process-Specified Addresses	966
38.7 Add Debugging for Detail	970

38.8	Batch Rule-Set Testing	971
38.9	Pitfalls	972
V:	<i>Appendixes</i>	973
A:	<i>The client.of File</i>	975
B:	<i>Host Status File Internals</i>	977
C:	<i>The Berkeley DB Database</i>	981
D:	<i>Sun Enhancements</i>	985
	<i>Bibliography</i>	991
	<i>Index</i>	997