Inferno™

Programmer's Manual
Volume 2

Third Edition

Vita Nuova Holdings Limited
The Innovation Centre
University Road
York YO10 5DG
England

Published by Vita Nuova Holdings Limited,
The Innovation Centre,
University Road,
York YO10 5DG,
England

Portions Copyright © 1995-1999 Lucent Technologies Inc. All Rights Reserved.
Revised and reproduced under licence, by Vita Nuova Holdings Limited.
Portions Copyright © 1997-2000 Vita Nuova Holdings Limited. All Rights Reserved.

All rights reserved; no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of the publishers.

First published 2000.

ISBN for complete set of 2 volumes: 0 9538701 0 3
ISBN for this volume: 0 9538701 2 X

Printed in Great Britain by
William Clowes,
Beccles,
Suffolk NR34 9QE,
England.

Cover Design: Jeff Parker

Trademarks referenced in this document:

Inferno, Dis, Styx and Limbo are registered trademarks of Vita Nuova Holdings Limited in the United States and other countries.
68020 and 68040 are trademarks of Motorola.
AMD is a trade mark of Advanced Micro Devices.
ARM is a trade mark of Advanced Risc Machines, Limited.
DSP3210 is a trade mark of AT&T.
Aladdin Ghostscript is a trademark of Aladdin Enterprises.
CGA is a trademark of International Business Machines Corporation.
Challenge, Indigo^2, Indy, and POWER Series are trademarks of Silicon Graphics, Inc.
Ethernet is a trademark of Xerox Corporation.
IBM, PS/2, and VGA are registered trademarks of International Business Machines Corporation.
IDEA is a trademark of Ascom-Tech AG.
Intel, i386, 960, 8088, 80286, 80386, 80486, and Pentium are trademarks of Intel Corporation.
Java is a trademark and Sun is a registered trademark of Sun Microsystems Inc.
Lucida and Pellucida are registered trademarks of Bigelow & Holmes.
MIPS and R3000 are registered trademarks of MIPS Technologies, Inc.
Microsoft is a registered trademark of Microsoft Corporation.
Windows, Windows NT and MS-DOS are registered trademarks of Microsoft Corporation in the United States and other countries.
NFS is a registered trademark of Sun Microsystems, Inc.
PDP and VAX are registered trademarks of Digital Equipment Corp.
Plan 9 is a trademark of Lucent Technologies Inc.
PostScript is a registered trademark of Adobe Systems Incorporated.
ProPhone is a registered trademark of Prolink Corporation.
R2000, R6000, R4000, and R4400 are trademarks of MIPS Technologies, Inc.
RC4 is a registered trademark of RSA Security Inc.
SecureNet is a registered trademark of Digital Pathways, Inc.
Silicon Graphics, IRIS Indigo, IRIS, and IRIX are registered trademarks of Silicon Graphics, Inc.
Sound Blaster is a registered trademark of Creative Labs, Inc.
SPARC is a registered trademark of SPARC International, Inc.
StrongARM is a registered trademark of Advanced RISC Machines, Ltd.
ThinkJet is a registered trademark of the Hewlett-Packard Company.
Unicode is a registered trademark of Unicode, Inc.
UNIX is a registered trademark of The Open Group.

Table of Contents

Getting Started

The Inferno Operating System 1
Sean Dorward, Rob Pike, David Leo Presotto, Dennis M. Ritchie, Howard Trickey, and Phil Winterbottom
An overview of the system.

The Styx Architecture for Distributed Systems 17
Rob Pike, Dennis M. Ritchie
A discussion of the Styx protocol.

Programming

A Descent into Limbo 27
Brian W. Kernighan
An introduction to the Limbo programming language.

The Limbo Programming Language 51
Dennis M. Ritchie
The Limbo reference manual; the definitive Limbo document.

Program Development under Inferno 109
Roger Peppé
An introduction to Limbo development using Acme.

Real Inferno 115
Eric Grosse
Floating point issues.

An Overview of Limbo/Tk 123
An overview of the use of Tk with Inferno.

User Interfaces

Acme: A User Interface for Programmers 139
Rob Pike
A system with a more radical approach to programming and editing.

The Inferno Shell 155
Roger Peppé
A view of the Inferno shell

Implementation

Dis Virtual Machine Specification 179
An informal definition of the Dis Virtual Machine.

The Several Inferno Ports 203
Charles Forsyth
A summary of the state of the ports and compilers included in this release.

Acid Reference Manual 209
Phil Winterbottom
The reference manual for the language and its libraries.

Native Kernel Debugging with Acid 235
Tad Hunt
A tutorial introduction to native kernel debugging with Acid.

Acid: A Debugger Built From A Language 251
Phil Winterbottom
An overview paper about the Acid debugger.

Maintaining Files on Plan 9 with Mk 265
Andrew G. Hume, Bob Flandrena
An introduction to the replacement for Make.

A Manual for the Assembler 279
Rob Pike
Notes on the current set of Inferno assemblers.

Plan 9 C Compilers 289
Ken Thompson
The design and some internals of the compiler suite.

Miscellaneous

The Design of the Inferno Virtual Machine 303
Phil Winterbottom, Rob Pike
Some background to the design.

Reliable Benchmarking with Limbo on Inferno 307
John Bates
Achieving reliable timings of Limbo programs.

Installation of the Inferno Software 327
Getting the system up and running.