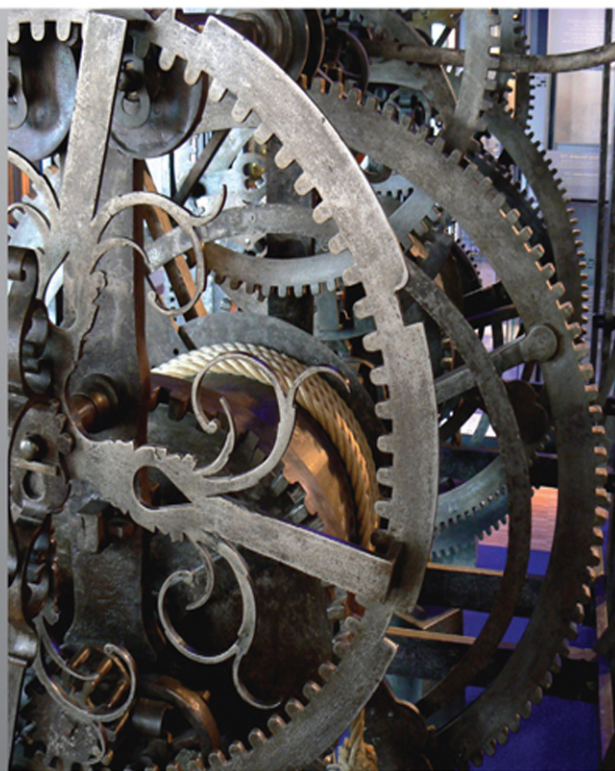


DTrace

DYNAMIC TRACING IN ORACLE® SOLARIS,
MAC OS X, AND FREEBSD



Brendan Gregg • Jim Mauro
Foreword by Bryan Cantrill

DTrace

DTrace: Dynamic Tracing in Oracle Solaris, Mac OS X, and FreeBSD

Table of Contents

Cover

Half Title

Title Page

Copyright Page

Contents

Foreword

Preface

Acknowledgments

About the Authors

Part I: Introduction

Chapter 1 Introduction to DTrace

What Is DTrace?

Why Do You Need It?

Capabilities

Dynamic and Static Probes

DTrace Features

A First Look

Overview

Architecture

Summary

Chapter 2 D Language

D Language Components

Table of Contents

- Probes
- Variables
- Aggregations
- Actions
- Options
- Example Programs
- Summary

Part II: Using DTrace

Chapter 3 System View

- Start at the Beginning
- Observing CPUs
- Observing Memory
- Observing Disk and Network I/O
- Summary

Chapter 4 Disk I/O

- Capabilities
- Disk I/O Strategy
- Checklist
- Providers
- Scripts
- Case Studies
- Summary

Chapter 5 File Systems

- Capabilities
- Strategy
- Checklist
- Providers
- Scripts
- Case Study
- Summary

Table of Contents

Chapter 6 Network Lower-Level Protocols

Capabilities

Strategy

Checklist

Providers

Scripts

Common Mistakes

Summary

Chapter 7 Application-Level Protocols

Capabilities

Strategy

Checklist

Providers

Scripts

Summary

Chapter 8 Languages

Capabilities

Strategy

Checklist

Providers

C

C++

Java

JavaScript

Perl

PHP

Python

Ruby

Shell

Tcl

Table of Contents

Summary

Chapter 9 Applications

Capabilities

Strategy

Checklist

Providers

Scripts

Case Studies

Summary

Chapter 10 Databases

Capabilities

Strategy

Providers

MySQL

PostgreSQL

Oracle

Summary

Part III: Additional User Topics

Chapter 11 Security

Privileges, Detection, and Debugging

Scripts

Summary

Chapter 12 Kernel

Capabilities

Strategy

Checklist

Providers

Scripts

Summary

Chapter 13 Tools

Table of Contents

The DTraceToolkit

Chime

DTrace GUI Plug-in for NetBeans and Sun Studio

DLight, Oracle Solaris Studio 12.2

Mac OS X Instruments

Analytics

Summary

Chapter 14 Tips and Tricks

Tip 1: Known Workloads

Tip 2: Write Target Software

Tip 3: Use grep to Search for Probes

Tip 4: Frequency Count

Tip 5: Time Stamp Column, Postsort

Tip 6: Use Perl to Postprocess

Tip 7: Learn Syscalls

Tip 8: timestamp vs. vtimestamp

Tip 9: profile:::profile-997 and Profiling

Tip 10: Variable Scope and Use

Tip 11: strlen() and strcmp()

Tip 12: Check Assumptions

Tip 13: Keep It Simple

Tip 14: Consider Performance Impact

Tip 15: drops and dynvardrops

Tip 16: Tail-Call Optimization

Further Reading

Appendix A: DTrace Tunable Variables

Appendix B: D Language Reference

Appendix C: Provider Arguments Reference

Providers

Arguments

Table of Contents

bufinfo_t
devinfo_t
fileinfo_t
cpuinfo_t
lwpsinfo_t
psinfo_t
conninfo_t
pktinfo_t
csinfo_t
ipinfo_t
ifinfo_t
ipv4info_t
ipv6info_t
tcpinfo_t
tcpsinfo_t
tcplinfo_t

Appendix D: DTrace on FreeBSD

Enabling DTrace on FreeBSD 7.1 and 8.0

DTrace for FreeBSD: John Birrell

Appendix E: USDT Example

USDT Bourne Shell Provider

Compared to SDT

Defining the Provider

Adding a USDT Probe to Source

Stability

Case Study: Implementing a Bourne Shell Provider

Where to Place the Probes

Appendix F: DTrace Error Messages

Privileges

Table of Contents

Message

Meaning

Suggestions

Drops

Message

Meaning

Suggestions

Aggregation Drops

Message

Meaning

Suggestions

Dynamic Variable Drops

Message

Meaning

Suggestions

Invalid Address

Message

Meaning

Suggestions

Maximum Program Size

Message

Meaning

Suggestions

Not Enough Space

Message

Meaning

Suggestions

Appendix G: DTrace Cheat Sheet

Synopsis

Table of Contents

Finding Probes

Finding Probe Arguments

Probes

Vars

Actions

Switches

Pragmas

One-Liners

Bibliography

Suggested Reading

Vendor Manuals

FreeBSD

Mac OS X

Solaris

Glossary

A

B

C

D

E

F

G

H

I

J

K

L

Table of Contents

M

N

O

P

R

S

T

U

V

W

X

Z

Index