2002 USENIX Annual Technical conference

Spanning over 25 years of experience and expertise, USENIX '02 offers unparalleled opportunities to explore the most influential emerging technical issues and get trained by master practitioners in cutting-edge technologies. Don't miss this opportunity to join leading developers, researchers, system administrators, and engineers at the core conference for the advanced computing community. Register today!

Conference Highlights

TECHNICAL TUTORIALS

KERNELS

FreeBSD *by Marshall Kirk McKusick*

Linux *by Ted Ts'o*

Solaris *by James Mauro & Richard McDougall*

SYSADMIN

Topics in UNIX and Linux Administration *by Trent Hein, Ned McClain, & Evi Nemeth*

System & Network Performance Tuning *by Marc Staveley*

Practical Wireless IP *by Phil Cox & Brad Johnson*

Advanced Solaris Sysadmin *by Peter Galvin*

SECURITY

Building Honey Pots *by Marcus Ranum*

Cisco's Security Features *by John Stewart*

Introduction to Computer Security *by Avi Rubin*

INVITED TALKS

Eric Allman, *Sendmail, Inc.,* **on Taking an Open Source Project to Market**

Steve Bellovin, *AT&T Labs—Research*, **on Internet Standards**

Alan Davidson, Center for Democracy and Technology, on Technology, Liberty, and Washington

Bruce Schneier, *Counterpane Internet Security,* **on Fixing Network Security by Hacking the Business Climate**

BIRDS-OF-A-FEATHER SESSIONS

Linux BoF Led by Linus Torvalds and Ted Ts'o

BSD Groups (NetBSD, OpenBSD, Darwin, FreeBSD, BSD/OS)

RECEPTION AT THE MONTEREY BAY AQUARIUM

Monterey Conference Center

Monday–Saturday

June 10–15, 2002

FREE Vendor Exhibition June 13–14

DISCOUNT DATE!

Early Bird Registration & Hotel Discount Deadline:

FRIDAY, MAY 17, 2002

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Carla Ellis

Chris Demetriou

Conference Organizers

Program Chair

Carla Ellis, *Duke University*

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Robert Watson, *NAI Labs & The FreeBSD Project*
Erez Zadok, *SUNY at Stony Brook*

"The Guru Is In" Coordinator

Lee Damon, *University of Washington*

An Invitation from the Program Chairs

Dear Colleague,

Technical progress in the computer field has not stood still during this eventful year. The USENIX Annual Tech '02 program reflects the needs of this dynamic community, covering a wealth of emerging technical issues and exploring the influence they will have on our field. This conference is *the* place to meet peers, learn from the experts, and share solutions.

Featuring expert instructors and a wide range of topics, our technical tutorials offer practical techniques that you can put to immediate use. Security is a major theme this year, with tutorials addressing all levels, from a basic introduction, to using system-specific security features, to practical cryptography. Other tutorials include system administration for various environments, kernal internals, performance tuning, networking, and much more.

High-quality refereed papers are the cornerstone of this conference's reputation for ground-breaking research. Presentations will include new work on file and storage systems, networking, programming models, network services, and mobile computing. It is always exciting to meet the bright young student researchers who have contributed to so many of the papers.

The FREENIX refereed track is the best place to hear about the latest developments from the freely-redistributable software community. Whether you're interested in hearing about Linux, *BSD, or X11-based graphical environments, or you just want a look at some of the hot new work being made available to the public, the FREENIX track has something for you.

Our Keynote address features Professor Lawrence Lessig from Stanford University who's talk "The Internet's Coming Silent Spring" will show how the Internet, originally built to enable neutral and unrestrained innovation, is now being undermined by those who were threatened by it's original network architecture.

Our Guru Is In sessions give you the opportunity to ask experts for answers on a range of topics from Linux on handhelds to legacy systems. Work-in-Progress Reports will give previews to research that is just on the horizon. Plus, you can organize your own Birds-of-a-Feather session to gather attendees with similar interests.

Newcomers and past attendees will find that our Annual Technical Conference offers a wealth of knowledge and insight. Join us in Monterey on June 10–15, 2002, to learn, to connect with people in your field, and to party!

For the USENIX 2002 Program Committees,

Carla Ellis, *Duke University*
Chris Demetriou, *Broadcom Corp.*
Program Chairs

Conference at a Glance

Sunday, June 9	
5:00 p.m.–9:00 p.m.	On-Site Registration
6:00 p.m.–7:00 p.m.	Welcome Get-Together
7:00 p.m.–8:00 p.m.	Conference Orientation
Monday, June 10	
7:30 a.m.–5:00 p.m.	On-Site Registration
9:00 a.m.–5:00 p.m.	Tutorial Program
Tuesday, June 11	
7:30 a.m.–5:00 p.m.	On-Site Registration
9:00 a.m.–5:00 p.m.	Tutorial Program
9:00 a.m.–5:00 p.m.	AFS Workshop
Wednesday, June 12	
7:30 a.m.–5:00 p.m.	On-Site Registration
9:00 a.m.–5:00 p.m.	Tutorial Program
9:00 a.m.–5:00 p.m.	AFS Workshop
6:00 p.m.–10:00 p.m.	Birds-of-a-Feather Sessions
Thursday, June 13	
7:30 a.m.–5:00 p.m.	On-Site Registration
8:45 a.m.–10:30 a.m.	Keynote Address
11:00 a.m.–5:30 p.m.	Technical Program
12:00 p.m.–7:00 p.m.	Vendor Exhibition
5:30 p.m.–7:00 p.m.	Exhibit Happy Hour
6:00 p.m.–10:00 p.m.	Birds-of-a-Feather Sessions
Friday, June 14	
7:30 a.m.–5:00 p.m.	On-Site Registration
9:00 a.m.–5:30 p.m.	Technical Program
10:00 a.m.–4:00 p.m.	Vendor Exhibition
12:30 p.m.–2:00 p.m.	Lunch in the Exhibition Hall
8:00 p.m.–10:00 p.m.	Dessert Reception at the Aquarium
10:00 p.m.–midnight	Birds-of-a-Feather Sessions
Saturday, June 15	
9:00 a.m.–3:30 p.m.	Technical Program
4:00 p.m.–5:30 p.m.	Joint Closing Session

USENIX 2002 Vendor Exhibition

DOUBLETREE HOTEL MONTEREY

THURSDAY, JUNE 13, 12 NOON–7:00 P.M.

FRIDAY, JUNE 14, 10:00 A.M.–4:00 P.M.

- **Preview innovative products and services**
- **Get the details from well-informed vendor representatives**
- **Compare solutions quickly on the floor, saving hours of research**

EXHIBITORS (AS OF 2/13/02)

AC&NC
www.acnc.com
Addison-Wesley
www.aw.com
Apple Computer Inc.
www.apple.com
Aptitune Corp.
www.aptitune.com
Cambridge Computer
www.camcom.com
CERT
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Enlighten Software
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ESM Services
www.esm.com
John Wiley & Sons
www.wiley.com
Linux International
www.li.org
O'Reilly & Associates
www.oreilly.com
Overland Data
www.overlanddata.com
Resilience Corp.
www.resilience.com
Sleepycat Software
www.sleepycat.com
Soft Tech
www.stsolutions.com
Symark Software
www.symark.com
TeraSolutions, Inc.
www.terasolutions.com
Vita Nuova Holdings
www.vitanuova.com
Zzyzx Peripherals
www.zzyzx.com

For exhibit and sponsorship opportunities, contact Shelley Gottlieb, shelley@usenix.org.

FREE EXHIBIT ADMISSION PASS at www.usenix.org/events/usenix02/

About USENIX

http://www.usenix.org/

USENIX is the Advanced Computing Systems Association. Since 1975, USENIX has brought together the community of system administrators, engineers, scientists, and technicians working on the cutting edge of the computing world. USENIX and its members are engaged in problem-solving, in innovation, and in research that works.

USENIX
THE ADVANCED COMPUTING SYSTEMS ASSOCIATION

About SAGE

http://www.sage.org/

SAGE, the System Administrators Guild, is a special technical group within USENIX. SAGE is dedicated to the recognition and advancement of the system administration profession.

SAGE
THE SYSTEM ADMINISTRATORS GUILD

Tutorials *Mon.–Wed., June 10–12*

To meet your needs, the Tutorial Program at the USENIX Annual Technical Conference provides in-depth, immediately useful instruction in the latest techniques, effective tools, and best strategies.

USENIX tutorials survey the topic, then dive right into the specifics of what to do and how to do it. Instructors are well-known experts in their fields, selected for their ability to teach complex subjects. Attend USENIX tutorials at Annual Tech '02 and take valuable skills back to your company or organization.

Register now to guarantee your first choice—seating is limited.

MONDAY

M1 Advanced Solaris System Administration Topics

M2 An Introduction to Computer Security NEW

M3 Inside the Linux Kernel

M4 System and Network Monitoring NEW

M5 Sendmail Configuration and Operation (Updated for Sendmail 8.12)

M6 Socket Programming NEW

M7 UNIX Security Threats and Solutions NEW

M8 FreeBSD Kernel Internals: Data Structures, Algorithms, and Networking—Part 1

TUESDAY

T1 Building Secure Software NEW

T2 Issues in UNIX Infrastructure Design

T3 Solaris Internals: Architecture, Tips, and Tidbits

T4 Topics in UNIX and Linux Administration, Part 1 NEW

T5 Perl for System Administration: The Power and the Praxis

T6 Real-World Intrusion Detection: Problems and Solutions

T7 Practical UNIX Cryptography NEW

T8 FreeBSD Kernel Internals: Data Structures, Algorithms, and Networking—Part 2

TUTORIAL FEES INCLUDE:
- ADMISSION TO THE TUTORIALS YOU SELECT
- LUNCH
- TUTORIAL CD-ROM
- PRINTED AND BOUND TUTORIAL MATERIALS FROM YOUR SESSIONS
- ADMISSION TO THE VENDOR EXHIBIT

Our guarantee: If you're not happy, we're not happy. If you feel a tutorial does not meet the high standards you have come to expect from USENIX, let us know by the first break and we will change you to any other available tutorial immediately.

WEDNESDAY

W1 Blueprints for High Availability: Designing Resilient Distrbuted Systems

W2 Practical Wireless IP: Concepts, Administration, and Security

W3 Building Honey Pots for Intrusion Detection NEW

W4 Topics in UNIX and Linux Administration, Part 2 NEW

W5 Exploring the Potential of LDAP

W6 System and Network Performance Tuning

W7 Cisco's Security Features: What They Are, Where to Use Them, and How to Configure Them NEW

W8 PHP—Scripting the Web NEW

CONTINUING EDUCATION UNITS (CEUs)

USENIX provides Continuing Education Units for a small additional administrative fee. The CEU is a nationally recognized standard unit of measure for continuing education and training, and is used by thousands of organizations. Each full-day tutorial qualifies for 0.6 CEUs. You can request CEU credit by completing the CEU section on the registration form. USENIX provides a certificate for each attendee taking a tutorial for CEU credit and maintains transcripts for all CEU students. CEUs are not the same as college credits. Consult your employer or school to determine their applicability.

MONDAY, JUNE 10, 2002

M1 Advanced Solaris System Administration Topics

Peter Baer Galvin, *Corporate Technologies*

Who should attend: UNIX administrators who need more knowledge of Solaris administration.

We will discuss the major new features of recent Solaris releases, including which to use (and how) and which to avoid. This in-depth course will provide the information you need to run a Solaris installation effectively. Updated to include Solaris 8 and several other new topics.

Topics include:
- Installing and upgrading
  - Architecting your facility
  - Choosing appropriate hardware
  - Planning your installation, file-system layout, post-installation
  - Installing (and removing) patches and packages
- Advanced features of Solaris
  - File systems and their uses
  - The /proc file system and commands
  - Useful tips and techniques
- Networking and the kernel
  - Virtual IP: configuration and uses
  - Kernel and performance tuning: new features, adding devices, tuning, debugging commands
  - Devices: naming conventions, drivers, gotchas
- Enhancing Solaris

M2 An Introduction to Computer Security NEW

Avi Rubin, *AT&T Labs–Research*

Who should attend: Anyone with a computer science degree or the equivalent experience who is not an expert in computer security. IT managers who need to understand how to evaluate risk, what the dangers are, and what countermeasures are available. We will emphasize issues of importance to system administrators.

As more and more of our lives move online, we are exposing more of ourselves

to often untraceable, malicious, and automated attack: credit card numbers, data, a group of machines that we manage, our time, our privacy. This tutorial seeks to sweep a broad brush across the field of computer security, addressing in particular the practical aspects of the field.

Topics include:

- Assessing risk
- Viruses and worms
- Cryptography
- Secure data storage and backup
- Secure data transfer, including SSL and IPsec
- Public Key Infrastructure (PKI)
- Firewalls
- Intrusion detection
- Network sniffing and sniff detection
- Denial-of-service attacks
- E-commerce and privacy

Attendees should leave with a general understanding of the field and a direction for learning more about each topic covered.

M3 Inside the Linux Kernel

Ted Ts'o, *IBM Linux Technology Center*

Who should attend: Application programmers and kernel developers. You should be reasonably familiar with C programming in the UNIX environment, but no prior experience with the UNIX or Linux kernel code is assumed.

This tutorial will give you an introduction to the structure of the Linux kernel, the basic features it provides, and the most important algorithms it employs.

The Linux kernel aims to achieve conformance with existing standards and compatibility with existing operating systems; however, it is not a reworking of existing UNIX kernel code. The Linux kernel was written from scratch to provide both standard and novel features, and takes advantage of the best practice of existing UNIX kernel designs.

Although the material will focus on the release version of the Linux kernel, it will also address aspects of the development kernel codebase where its substance differs. It will not contain any detailed examination of the source code but will, rather, offer an overview and roadmap of the kernel's design and functionality.

Topics include:

- How the Linux kernel is organized: scheduler, virtual memory system, filesystem layers, device driver layers, and networking stacks
- The interface between each module and the rest of the kernel, and the functionality provided by that interface
- The common kernel support functions and algorithms used by that module
- How modules provide for multiple implementations of similar functionality (network protocols, filesystem types, device drivers, and architecture-specific machine interfaces)
- Basic ground rules of kernel programming (dealing with issues such as races and deadlock conditions)
- Implementation of the most important kernel algorithms and their general properties (aspects of portability, performance, and functionality)
- The main similarities and differences between Linux and traditional UNIX kernels, with attention to places where Linux implements significantly different algorithms
- Details of the Linux scheduler, its VM system, and the ext2fs file system
- The strict requirements for ensuring that kernel code is portable

M4 System and Network Monitoring NEW

John Sellens, *Certainty Solutions*

Who should attend: Network and system administrators interested in real-life, practical, host- and network-based monitoring of their systems and networks. Participants should have an understanding of the fundamentals of networking, basic familiarity with computing and network components, and some familiarity with UNIX and scripting languages.

This tutorial will introduce the concepts and functions of monitoring systems and will describe the Simple Network Management Protocol (SNMP). It will review some of the most popular monitoring tools and will cover the installation and configuration of a number of freely available monitoring packages. The emphasis will be on the practical, and the tutorial will provide examples of easy-to-implement monitoring techniques.

Topics include:

- Monitoring—goals, techniques, reporting
- SNMP—the protocol, reference materials, relevant RFCs
- Introduction to SNMP MIBs (Management Information Bases)
- SNMP tools and libraries
- Other non-SNMP tools
- Security concerns when using SNMP and other tools on the network
- Monitoring applications—introductions, use, benefits and complications, installation and configuration (Big Brother, NetSaint, SNIPS, MRTG, Cricket, etc.)
- Special situations—remote locations, firewalls, etc.
- Monitoring implementation roadmap—policies, practices, notifications, escalations, reporting

Participants should expect to leave the tutorial with the information needed to immediately start using a number of monitoring systems and techniques to improve their ability to manage and maintain their systems and networks.

M5 Sendmail Configuration and Operation (Updated for Sendmail 8.12)

Eric Allman, *Sendmail, Inc.*

Who should attend: System administrators who want to learn more about the sendmail program, particularly details of configuration and operational issues (this tutorial will not cover mail front ends). This intense, fast-paced tutorial is aimed at people who have already been exposed to sendmail. It describes the latest release of sendmail from Berkeley, version 8.12.

Topics include:

- The basic concepts of configuration: mailers, options, macros, classes, keyed files (databases), and rewriting rules and rulesets
- Configuring sendmail using the M4 macro package
- Day-to-day management issues, including alias and forward files,

"special" recipients (files, programs, and include files), mailing lists, command line flags, tuning, and security
- How sendmail interacts with DNS

M6 Socket Programming NEW

George V. Neville-Neil, *Neville-Neil Consulting*

Who should attend: Anyone whose responsibility it is to write or maintain code that uses the sockets API. The ability to read C code is required. A basic understanding of computer networks is a plus.

The sockets API is the most widely used and accepted set of interfaces for implementing client/server network applications. It is implemented on all flavors of UNIX, the Windows platform, and many embedded operating systems (VxWorks, PSOS, etc.). Familiarity with this API set is a must for anyone who writes or maintains network applications.

This course uses working examples to teach software engineers and programmers how to use the sockets API to create their own client and server applications. The differences between the TCP and UDP transport protocols for network applications are highlighted throughout so that the student comes away with a clear understanding of when it is appropriate to use which technology.

Topics include:
- Overview of the TCP/IP protocols
- Implementing a network client
- Implementing a network server
- Debugging network applications
- Common pitfalls in network application programming

TCP/IP internals are *not* covered in this course. After taking this tutorial, students will be able to create and maintain networking applications which use the sockets API.

M7 UNIX Security Threats and Solutions NEW

Matt Bishop, *University of California, Davis*

Who should attend: Anyone interested in threats to UNIX security and how to deal with them.

This tutorial uses case histories to show what vulnerabilities the attackers exploited, how the system administrators might have closed those loopholes, and how the intruders were discovered. Concepts and mechanisms, as well as publicly available tools, are discussed. This course focuses on non-network problems.

Topics include:
- Security policies vs. security mechanisms
- Password security and cracking
- Files and auditing
- Access control mechanisms
- Management of privileges
- Malicious logic and the UNIX system
- Basic vulnerabilities analysis
- Basic incident management
- Security holes past and current
- Managing the humans
- Where to get help

M8 FreeBSD Kernel Internals: Data Structures, Algorithms, and Networking—Part 1

Marshall Kirk McKusick, *Author and Consultant*

Who should attend: This two-day course provides a broad overview of how the FreeBSD kernel implements its basic services. It will be most useful to those who need to learn how these services are provided. Individuals involved in technical and sales support can learn the capabilities and limitations of the system; applications developers can learn how to effectively and efficiently interface to the system; systems programmers without direct experience with the FreeBSD kernel can learn how to maintain, tune, and interface to such systems. This course is directed to users who have had at least a year of experience using a UNIX-like system and the C programming language. They should have an understanding of fundamental algorithms (searching, sorting, and hashing) and data structures (lists, queues, and arrays). Students will not need to prove relationship with a source license holder, as source code examples will be taken from the freely distributable FreeBSD system.

This course will provide a firm background in the FreeBSD kernel. The POSIX kernel interfaces will be used as examples where they are defined. Where they are not defined, the FreeBSD interfaces will be described. The course will cover basic kernel services, process structure, virtual and physical memory management, scheduling, paging and swapping. The kernel I/O structure will be described showing how I/O is multiplexed, special devices are handled, character processing is done, and the buffer pool is managed. The implementation of the filesystem and its capabilities including updates will be described. The filesystem interface will then be generalized to show how to support multiple filesystem types such as Sun Microsystem's Network File System (NFS). The course will also cover the FreeBSD socket-based network architecture, layering, and implementation. The socket communications primitives and internal layering will be discussed, with emphasis on the interfaces between the layers; the TCP/IP implementation will be used as an example. A discussion of routing issues will be included. The presentations will emphasize code organization, data structure navigation, and algorithms. It will not cover the machine specific parts of the system such as device drivers.

Topics include:

Day 1 morning: Kernel Resource Management
- Basic kernel services
- Process structure
- Scheduling
- Signals
- Virtual memory management

Day 1 afternoon: Kernel I/O structure
- Special files
- Terminal handling
- Multiplexing I/O
- Autoconfiguration strategy
- Structure of a disk device driver

Day 2 morning: Filesystems
- Filesystem services

- Block I/O system (buffer cache)
- Filesystem implementation
- Soft Updates and Snapshots
- Support for multiple filesystems
- Network File System (NFS)

Day 2 afternoon: Networking Implementation

- Concepts and terminology
- Basic IPC services
- System layers and interfaces
- Routing issues
- Internet protocols (TCP/IP)

Course text: Marshall Kirk McKusick, Keith Bostic, Michael J Karels, and John S. Quarterman, *The Design and Implementation of the 4.4BSD Operating System* (Addison-Wesley, 1996).

TUESDAY, JUNE 11, 2002

T1 Building Secure Software NEW

Gary McGraw, *Cigital*

Who should attend: Developers, architects, and managers charged with developing code for security-critical and mission-critical projects (e.g., code that is intended to live on the Net), and security practitioners who must grapple with software security issues such as code review and risk analysis. Participants should have some familiarity with software development. Code examples include C, Java, and Python. This tutorial is based on material found in the book *Building Secure Software*, published by Addison-Wesley in their Professional Computing series.

What do wireless devices, cell phones, PDAs, browsers, operating systems, network services, public key infrastructure, and firewalls have in common? The answer is "software." Software is everywhere, and it is not usually built to be secure. This tutorial explains why the key to proactive computer security is making software behave. With software complexity growing alarmingly—the source code base for Windows XP is 40 million lines—we have our work cut out for us. Clearly, the penetrate-and-patch approach is non-optimal. Even worse is bolting security mechanisms on as an afterthought. Building software properly, both at the design and the implementation level, is a much better approach. This tutorial takes an in-depth look at some common software security risks, including buffer overflows, race conditions, and random number generation, and goes on to discuss essential guidelines for building secure software. A risk-driven approach to software security which integrates analysis and risk management throughout the software lifecycle is the key to better computer security.

Topics include:

- Aligning security goals and software project goals
- Software risk management
- Performing risk analysis
- Integrating securing into the software lifecycle
- Code-scanning technology
- Common software security risks
- Design versus implementation risks
- Building software security capability
- Open source and security
- Guidelines for building secure software

Upon completion of this tutorial, participants will understand why software security is essential to any organization building Net-enabled software, how to avoid common security problems, and how to design more secure software.

T2 Issues in UNIX Infrastructure Design

Lee Damon, *University of Washington*

Who should attend: Anyone who is designing, implementing, or maintaining a UNIX environment with 2 to 20,000+ hosts. System administrators, architects, and managers who need to maintain multiple hosts with few admins.

This tutorial won't propose one "perfect solution." Instead, it will try to raise all the questions you should ask in order to design the right solution for your needs.

Topics include:

- Administrative domains: Who is responsible for what? What can users do for themselves?
- Desktop services vs. farming
- Disk layout
- Free vs. purchased solutions: Do you write your own, or do you outsource?
- Homogeneous vs. heterogeneous
- Master database: What do you need to track, and how?
- Policies to make your life easier
- Push vs. pull: Do you force data to each host, or wait for a client request?
- Quick replacement techniques: How to get the user back up in 5 minutes
- Remote install/upgrade/patching: How can you implement lights-out operation? Handle remote user sites? Keep up with vendor patches?
- Scaling and sizing: How do you plan?
- Security vs. sharing
- Single sign-on: Can one-password access to multiple services be secure?
- Single system images: Should each user see everything the same way, or should each user's access to each service be consistent with his/her own environment?
- Tools: What's free? What should you buy? What can you write yourself?

T3 Solaris Internals: Architecture, Tips, and Tidbits

James Mauro and Richard McDougall, *Sun Microsystems, Inc.*

Who should attend: Software engineers, application architects and developers, kernel developers, device driver writers, system administrators, performance analysts, capacity planners, Solaris users who wish to know more about the system they're using and the information available from bundled and unbundled tools, and anyone interested in operating system internals.

The installed base of Solaris systems being used for various commercial data-processing applications across all market segments and scientific computing applications has grown dramatically over the last several years, and it continues to grow. As an operating system, Solaris has evolved considerably, with some significant changes made to the UNIX SVR4 source base on which the early system was built. An understanding of how the system works is required in order to design and develop applications that take maximum advantage of the various features of the operating sys-

tem, to understand the data made available via bundled system utilities, and to optimally configure and tune a Solaris system for a particular application or load.

Topics include the major subsystems of the Solaris 8 kernel. We review the major features of the release and take a look at how the major subsystems are tied together. We cover in detail the implementation of Solaris services (e.g. system calls) and low-level functions, such as synchronization primitives, clocks and timers, and trap and interrupt handling. We discuss the system's memory architecture; the virtual memory model, process address space and kernel address space, and memory allocation. The Solaris process/thread model is discussed, along with the kernel dispatcher and the various scheduling classes implemented and supported. We cover the Virtual File System (VFS) subsystem, the implementation of the Unix File System (UFS), and file IO-related topics.

All topics are covered with an eye to the practical application of the information, such as for performance tuning or software development. Solaris networking (topics related to TCP/IP and STREAMS) is not covered in this course.

After completing this course, participants will have a solid understanding of the internals of the major areas of the Solaris kernel that they will be able to apply to systems performance analysis, tuning, load/behavior analysis, and application development.

T4 Topics in UNIX and Linux Administration, Part 1

NEW

Trent Hein and Ned McClain, *Applied Trust;* Evi Nemeth, *University of Colorado*

Who should attend: System and network administrators who are interested in picking up several new technologies in an accelerated manner. The format consists of six topics.

Topics include:

- Logical Volume Management for Linux: Logical volume support for Linux has brought storage flexibility and high availability to the masses. By abstracting physical storage devices, logical volumes let you grow and shrink partitions, efficiently back up databases, and much more. We'll talk about Linux LVM, what you need to get it up and running, and how to take advantage of its many features.
- Security Packet Filtering Primer: What does the word "firewall" really mean, and how do you set up a packet filter list to implement a basic one? We'll teach you the dos and don'ts of creating a tough packet filter, and talk specifically about capabilities of packages available for Linux.
- What's New in BIND9? BINDv9 includes a long laundry list of features needed for modern architectures, huge zones, machines serving a zillion zones, co-existence with PCs, security, and IPv6—specifically, dynamic update, incremental zone transfers, DNS security via DNSSEC and TSIG, A6, and DNAME records. We'll talk about the gory details of these new features.
- Network Server Performance Tuning: Instead of throwing expensive hardware at a performance problem, consider that many performance problems are really due to misconfigured networks, systems, and applications. We'll focus on Linux and UNIX performance tuning, with an emphasis on low-cost, high-impact strategies and solutions.
- Security Crisis Case Studies: Before your very eyes, we'll dissect a set of security incident case studies using many tools available on your system or from the Net. We'll specifically describe how to avoid common security-incident pitfalls.
- Policy and Politics: Many of the policies and procedures followed at a site are carefully filed in the sysadmin's head. With the worldwide Net invading your local site, these secrets need to be written down, run by lawyers, and followed by your sysadmin staff. We will discuss approaches to these tasks, both good and bad, and illustrate with war stories, sample policy agreements, and procedure checklists.

T5 Perl for System Administration—The Power and the Praxis

David N. Blank-Edelman, *Northeastern University CCS*

Who should attend: People with system administration duties, advanced-beginner to intermediate Perl experience, and a desire to make their jobs easier and less stressful in times of sysadmin crises.

Perl was originally created to help with system administration, so it is a wonder that there isn't more instructional material devoted to helping people use Perl for this purpose. This tutorial hopes to begin to remedy this situation by giving you six solid hours of instruction geared towards putting your existing Perl knowledge to practice in the system administration realm.

The morning section will concentrate on the power of Perl in this context. Based on the instructor's O'Reilly book, we'll take a multi-platform look at using Perl in cutting-edge and old-standby system administration domains. This jam-packed survey will include:

- Secure Perl scripting
- Dealing with files and file systems (including source control, XML, databases, and log files)
- Dealing with SQL databases via DBI and ODBC
- Email as a system administration tool (including spam analysis)
- Network directory services (including NIS, DNS, LDAP, and ADSI)
- Network management (including SNMP and WBEM)

In the afternoon, we will look at putting our Perl knowledge to work for us to solve time-critical system administration problems using short Perl programs. Centered around a set of "battle stories" and the Perl source code used to deal with them, we'll discuss different approaches to dealing with crises using Perl.

At the end of the day, you'll walk away from this class with Perl approaches and techniques that can help you solve your daily system administration problems. You'll have new ideas in hand for writing small Perl programs to get you out of big sysadmin pinches. And on top of all this,

you are also likely to deepen your Perl knowledge.

T6 Real-World Intrusion Detection: Problems and Solutions

Phil Cox and Mark Mellis, *SystemExperts Corporation*

Who should attend: System and network administrators who implement or maintain intrusion detection systems, managers charged with selecting and setting intrusion detection requirements, and anyone who wants to know the details of how to make intrusion detection work. Familiarity with TCP/IP networking is a plus.

In today's increasingly networked world, intrusion detection is essential for protecting resources, data, and reputation. It's a rapidly evolving field with several models and deployment methods from which to choose.

After taking this tutorial, attendees will understand the fundamental concepts of intrusion detection and will gain practical insights into designing, deploying, and managing intrusion detection systems in the real world.

Topics include:

- Why intrusion detection?
- ID and the organization
- Intrusion detection basics
  - Terms and definitions
  - Host-based systems
  - Network-based systems
  - Hybrid systems
- How attackers attempt to bypass IDS systems
- Case studies for small, medium, and large deployments

T7 Practical UNIX Cryptography NEW

Craig Hunt, *WroteTheBook.com*

Who should attend: System administrators interested in using the cryptographic tools that are now available for UNIX. System administrators interested in practical configuration examples will benefit the most. Attendees need basic system administration skills and knowledge of UNIX configuration to reap the greatest benefit from this course.

Export restrictions have eased, and the RSA patent has expired, removing legal barriers to strong encryption. Soon all Linux and UNIX systems will ship with built-in cryptographic capabilities. System administrators need to understand what those tools can and cannot do for them and how to use the tools. This course outlines the current state of cryptographic support in UNIX and shows attendees how to make use of SSL and SASL services. The network protocols that underlie these cryptographic services are described. Practical advice about using strong authentication and encrypted data streams is given. This tutorial provides detailed, practical examples of installing, configuring, and using OpenSSL and SASL to support encryption for applications such as Apache. Installation, configuration and use of encryption tools such as SSH and GPG are also covered.

Topics include:

- The basics
  - Threats to data
  - Types of encryption and their roles
- Simple Authentication and Security Layer (SASL)
  - The role of SASL
  - Terminology
  - Supported authentication techniques
  - Installation, configuration, and use
- GNU Privacy Guard (GPG)
  - The role of GPG
  - Obtaining and installing GPG
  - Encrypting and protecting email
- Secure Shell (SSH)
  - The role of SSH
  - SSH protocol
  - Obtaining and installing SSH
  - Client and server configuration
  - Key distribution issues
- Secure Sockets Layer (SSL)
  - The role of SSL
  - TLS protocol
  - Certificates
  - Obtaining, configuring, and using OpenSSL
  - Using OpenSSL with Apache
  - Securing services with stunnel

T8 FreeBSD Kernel Internals: Data Structures, Algorithms, and Networking—Part 2

Marshall Kirk McKusick, *Author and Consultant*

Please see the description under M8.

Note: Attendees of Tuesday's session will be expected to possess familiarity with the concepts covered on Monday.

WEDNESDAY, JUNE 12, 2002

W1 Blueprints for High Availability: Designing Resilient Distributed Systems

Evan Marcus, *VERITAS Software Corporation*

Who should attend: Beginning and intermediate UNIX system and network administrators, and UNIX developers concerned with building applications that can be deployed and managed in a highly resilient manner. A basic understanding of UNIX system programming, UNIX shell programming, and network environments is required.

This tutorial will explore procedures and techniques for designing, building, and managing predictable, resilient UNIX-based systems in a distributed environment. We will discuss the trade-offs among cost, reliability, and complexity.

Topics include:

- What is high availability? Who needs it?
- Defining uptime and cost; "big rules" of system design
- Disk and data redundancy; RAID and SCSI arrays
- Host redundancy in HA configs
- Network dependencies
- Application system programming concerns
- Anatomy of failovers: applications, systems, management tools

- Planning disaster recovery sites and data updates
- Security implications
- Upgrade and patch strategies
- Backup systems: off-site storage, redundancy, and disaster recovery
- Managing the system: managers, processes, verification

W2 Practical Wireless IP: Concepts, Administration, and Security

Philip Cox and Brad C. Johnson, *SystemExperts Corporation*

Who should attend: Users, administrators, managers, and others interested in learning about some of the fundamental security and usage issues around wireless IP services. This tutorial assumes some knowledge of TCP/IP networking and client/server computing, the ability or willingness to use administrative GUIs to set up a device, and a general knowledge of common laptop environments.

Whether you like it or not, wireless services are popping up everywhere. And you and your organization will be responsible for understanding and managing the devices you possess. Since the purpose of wireless is to share data when you aren't directly attached to a wired resource, you need to understand the fundamental security and usage options. In this tutorial we will cover a number of topics that affect you in managing and using wireless services. Some of the topics will be demonstrated live using popular wireless devices.

Topics include:

- Cellular services basics
  - What's out there?
  - Who's using what?
  - What really matters?
- Wireless LAN fundamentals
  - Architecture
  - Threats
  - 802.11b
  - Configuration examples
  - Antennas
- Access points
  - Channels, placement
  - Bandwidth, aggregation
  - Congestion
  - Roaming, signals
- General issues
  - Sniffers
  - Building your own access point
  - 802.11a

W3 Building Honey Pots for Intrusion Detection

NEW

Marcus Ranum, *NFR Security, Inc.*

Who should attend: System and network managers with administrative skills and a security background. The tutorial examples will be based on UNIX/Linux. While the materials may be of interest to a Windows/NT administrator, attendees will benefit most if they have at least basic UNIX system administration skills.

This class provides a technical introduction to the art of building honey pot systems for intrusion detection and burglar-alarming networks. Students completing this class will come away armed with the knowledge that will enable them to easily assemble their own honey pot, install it, maintain it, keep it secure, and analyze the data from it.

Topics include:

- Introduction
  - IDSes
  - Fundamentals of burglar alarms
  - Fundamentals of honey pots
  - Fundamentals of log-data analysis
  - Spoofing servers
- Overview of our honey pot's design
  - System initialization
  - Services
  - Spoofing server implementation walkthrough
  - Multiway address/traffic manipulation
  - Logging architecture: syslogs, XML logs, statistical processing
  - Simple tricks for information visualization
- Crunchy implementation details
  - How to write spoofing rules
  - How to write log filtering rules
- Management
  - How to get help in analyzing attacks
  - Keeping up to date

Auxiliary materials: Attendees will receive a bootable CD-ROM containing a mini UNIX kernel and preconfigured software, and will also have source-code access to the honey pot building toolkit. Attendees may also wish to review The Honeynet Project, eds., *Know Your Enemy: Revealing the Security Tools, Tactics, and Motives of the Blackhat Community* (Addison-Wesley, 2001).

W4 Topics in UNIX and Linux Administration, Part 2

NEW

Trent Hein and Ned McClain, *Applied Trust;* Evi Nemeth, *University of Colorado*

Who should attend: System and network administrators who are interested in picking up several new technologies in an accelerated manner. (Note: M4 is not a prerequisite.) The format consists of six topics.

Topics include:

- Efficient Server Log Management: Server and network device logs are one of the most useful sources of performance and security information. Unfortunately, system logs are often overlooked by organizations, out of either a lack of time or a preference for information from fancier intrusion detection systems. We present a set of open source tools and a unified strategy for securely managing centralized system logs.
- What's New with Sendmail: Newer versions of sendmail ship with a wealth of features every system administrator should know about. From advanced virus and spam filtering (Milter), to IPv6, to improved LDAP and mailbox abstraction support, we discuss sendmail's hot new features, quirks, and tricks.
- Performance Crisis Case Studies: Trying to squeeze more performance out of your existing environment? We'll walk you through the pathology of actual performance crisis situations we've encountered, and talk not only about how to fix them but also how to avoid them altogether. There's nothing like learning from real-world situations!
- Security Tools: A new generation's worth of security management tools are on the loose. We'll help you understand how to use them to your

advantage. We'll examine network scanning tools such as Nessus and nmap, as well as new tools to facilitate security forensics.
- Site Localization and Management: Wouldn't it be nice if new system arrivals meant pushing a button and watching the localization work happen magically before your eyes? Imagine if systems at your site all shared a consistent configuration! We'll talk about modern tools for localization and mass deployment of systems, and how to keep systems up-to-date on a going forward basis.
- Security Incident Recovery: You've been vigilant about your site's security, but the day still comes when you detect an intruder. How do you handle the situation, analyze the intrusion, and restore both security and confidence to your environment? This crash course in incident handling will give you the skills you need to deal with the unthinkable.

W5 Exploring the Potential of LDAP

Gerald Carter, *Hewlett Packard*

Who should attend: Administrators and programmers interested in the potential of the Lightweight Directory Access Protocol (LDAP) and in exploring issues related to deploying an LDAP infrastructure. This tutorial is not a how-to for a specific LDAP server, nor is it an LDAP developers' course. Rather, it is an evaluation of the potential of LDAP to allow the consolidation of existing deployed directories. No familiarity with LDAP or other Directory Access Protocols will be assumed.

System administrators today run many directory services, though they may be called by such names as DNS and NIS. LDAP, the up-and-coming successor to the X500 directory, promises to allow administrators to consolidate multiple existing directories into one. Vendors across operating-system platforms are lending support.

Topics include:
- The basics of LDAP
- Current technologies employing LDAP services
- Replacing NIS using LDAP
- Integrating authentication mechanisms for other services (e.g., Apache, Sendmail, Samba) with LDAP
- LDAP interoperability with other proprietary directory services, such as Novell's NDS and Microsoft's Active Directory
- Programming tools and languages available for implementing LDAP support in applications

W6 System and Network Performance Tuning

Marc Staveley, *Soma Networks*

Who should attend: Novice and advanced UNIX system and network administrators, and UNIX developers concerned about network performance impacts. A basic understanding of UNIX system facilities and network environments is assumed.

We will explore techniques for tuning systems, networks, and application code. Starting from a single-system view, we'll examine how the virtual memory system, the I/O system, and the file system can be measured and optimized. We'll move on to Network File System tuning and performance strategies. Detailed treatment of network performance problems, including network design and media choices, will lead to examples of network capacity planning. Application issues, such as system call optimization, memory usage and monitoring, code profiling, real-time programming, and controlling response time will be covered. Many examples will be given, along with guidelines for capacity planning and customized monitoring based on your workloads and traffic patterns. Analysis periods for particular situations will be provided.

Topics include:
- Performance tuning strategies
  - Practical goals
  - Monitoring intervals
  - Useful statistics
  - Tools, tools, tools
- Server tuning
  - Filesystem and disk tuning
  - Memory consumption and swap space
  - System resource monitoring
- NFS performance tuning
  - NFS server constraints
  - NFS client improvements
  - NFS over WANs
  - Automounter and other tricks
- Network performance, design, and capacity planning
  - Locating bottlenecks
  - Demand management
  - Media choices and protocols
  - Network topologies: bridges, switches, routers
  - Throughput and latency
  - Modeling resource usage
- Application tuning
  - System resource usage
  - Memory allocation
  - Code profiling
  - Job scheduling and queuing
  - Real-time issues
  - Managing response time

W7 Cisco's Security Features: What They Are, Where to Use Them, How to Configure Them NEW

John Stewart, *Digital Island, Inc.*

Who should attend: Network and system administrators running Cisco networks, and security professionals.

It's common knowledge that over 85% of all Internet traffic crosses a Cisco product at one time or another. Given this fact, it is obvious that improving security on Cisco products can improve the overall security of your site as well as the overall security of the Internet. However, the security features available in Cisco products can be a discipline in themselves. This class takes a nuts-and-bolts approach to deciding which Cisco security features to use, and when and where to use them. A sample network is used as the basis for the class. For each area, sample uses and actual configuration techniques are discussed.

Topics include:
- Perimeter Security
  - Cisco Access Control Lists (ACLs)
  - Lock and key
  - TCP intercept
  - Context-Based Access Control (CBAC)

- Firewalling technologies compared and contrasted
- PIX
- IOS
- Access Lists revealed
  - Basic vs. extended
  - Where and how to use ACLs
  - Event logging
  - Per-user ACLs on dial-up ports
- Router-to-router security
  - Shared symmetrical application keys
  - Distributed Director
  - Remote access
  - Route authentication
- User security
  - Authentication, Authorization, Accounting (AAA)
  - TACACS
  - Fixed, OTP, SecureCard
  - RADIUS
  - Kerberos
- IPSec
  - Current standards update
  - Deploying IPSec with other technologies
  - ISAKMP/Oakley
  - Availability
  - Configuring and using IPSec
- Network Address Translation (NAT)
  - Hiding your company
  - Hiding your Web servers
  - Using NAT over dial-up
- VPN
  - VPDNs
  - GRE tunnels
  - Layer 2 Forwarding (L2F)
  - L2TP tunnels

W8 PHP: Scripting the Web NEW

Rasmus Lerdorf, *Consultant*

Who should attend: Web site designers or programmers working on Web-related projects. No programming background is required, but a basic understanding of HTML and HTTP is assumed.

PHP is a popular scripting language used for creating dynamic Web sites. This tutorial, taught by the original developer of the language, will cover all the main features of the language.

Topics include:

- History
- Language overview
- Sessions
- Error handling
- Database examples
- Creating graphics on the fly
- Creating PDF and Flash on the fly
- XML/XSLT
- Caching, content compression, and other tips
- Content management
- Extending PHP

Anybody involved with Web development will come out of this tutorial with some new approaches to common problems.

INSTRUCTORS

Eric Allman (M5) is the original author of sendmail. He

is the author of syslog, tset, the -me troff macros, and trek. He was the chief programmer on the INGRES database management project, designed database user and application interfaces at Britton Lee (later Sharebase), and contributed to the Ring Array Processor project at the International Computer Science Institute. He is a former member of the USENIX Board of Directors.

Matt Bishop (M7) began working on problems of com-

puter security, including the security of the UNIX operating system, at Purdue, where he earned his doctorate in 1984. He worked in industry and at NASA before becoming a professor, teaching courses in computer security, cryptography, operating systems, and software engineering at both Dartmouth College and the University of California at Davis, where he teaches now. Matt's current research interests are analyzing vulnerabilities in operating systems, protocols, and software in general; denial of service; intrusion detection; and formal models of access control.

David N. Blank-Edelman (T5) is the Director of

Technology at the Northeastern University College of Computer Science and the author of *Perl for System Administration* (O'Reilly). He has spent the last 15 years as a system/network administrator in large multi-platform environments and has served as Senior Technical Editor for the *Perl Journal*. He has also written many magazine articles on world music.

Gerald Carter (W5), a member of the Samba Team since

1998, is employed by Hewlett Packard as a Software Engineer, working on Samba-based print appliances. He is writing a guide to LDAP for system administrators to be published by O'Reilly. Jerry holds an M.S. in computer science from Auburn University, where he also served as a network and systems administrator. Gerald has published articles with Web-based magazines such as *Linuxworld* and has authored courses for companies such as Linuxcare. He recently completed the second edition of *Teach Yourself Samba in 24 Hours* (Sams Publishing).

Philip Cox (T6, W2) is a consultant with SystemExperts

Corporation. Phil frequently writes and lectures on issues of UNIX and Windows NT integration and on information security. He is the lead author of *Windows 2000 Security Handbook, 2nd Edition* (Osborne McGraw-Hill), a contributing author of *Windows NT/2000 Network Security* (Macmillan Technical Publishing), and a featured columnist in *;login: The Magazine of USENIX & SAGE*. He has served on numerous USENIX program committees. Phil holds a B.S. in computer science from the College of Charleston, South Carolina.

Lee Damon (T2) holds a B.S. in speech communication

from Oregon State University. He has been a UNIX system administrator since 1985 and has been active in SAGE since its inception. He has developed several large-scale mixed environments. He is a member of the SAGE Ethics Working Group and was one of the commentators on the SAGE Ethics document. He has championed awareness of ethics in the system administration community, including writing ethics concerns into policy documents.

Peter Baer Galvin (M1) is the chief technologist for

Corporate Technologies, Inc., and was the systems manager for Brown University's Computer Science Department. He has written articles for *Byte* and other magazines, is a columnist for *SunWorld*, and is co-author of the *Operating Systems Concepts* and the *Applied Operating Systems Concepts* textbooks. Peter has taught tutorials on security and systems administration and has given talks at many conferences and institutions.

Trent Hein (T4, W4) is co-founder of Applied Trust

Engineering. Previously, he was the CTO at XOR Inc., where he focused on using UNIX and Linux in production-grade commercial environments.Trent worked on the 4.4 BSD port to the MIPS architecture at Berkeley, is co-author of both the *UNIX Systems Administration Handbook* and the *Linux Administration*

Handbook, and holds a B.S. in computer science from the University of Colorado. Email him at trent@atrust.com.

Craig Hunt (T7) is the author of the best-sellers *TCP/IP Network Administration* (O'Reilly) and *Linux Network Servers 24seven* (Sybex). Craig is also the series editor for the Craig Hunt Linux Library from Sybex, a library of advanced system administration books. He has more than 20 years of computer experience and more than 10 years experience in training computer science professionals. He is a well-known lecturer, who speaks about networking and Linux at USENIX, LinuxWorld, Networld+Interop, COMDEX, ComNet, and the Open Source Software Convention.

Brad C. Johnson (W2) is vice president of SystemExperts Corporation. He has participated in the Open Software Foundation, X/Open, and the IETF, and has often published about open systems. Brad has served as a security advisor to organizations such as Dateline NBC and CNN. He is a frequent tutorial instructor and conference speaker on network security, penetration analysis, middleware, and distributed systems. He holds a B.A. in computer science from Rutgers University and an M.S. in applied management from Lesley University.

Rasmus Lerdorf (W8) has been designing large-scale UNIX-based solutions since 1989. In the Open Source community, he is known mostly as the creator of the PHP scripting language. Rasmus has contributed to a number of Apache-related projects and is a member of the Apache core team. He currently lives in the San Francisco Bay Area with his wife, Christine. He can be reached at rasmus@php.net.

Evan Marcus (W1) , who has 14 years of experience in UNIX systems administration, is now a Senior Systems Engineer and High Availability Specialist with VERITAS Software Corporation. At Fusion Systems and OpenVision Software, Evan worked to bring the first high-availability software application for SunOS and Solaris to market. He is the author of several articles and talks on the design of high availability systems and is the co-author, with Hal Stern, of *Blueprints for High Availability: Designing Resilient Distributed Systems* (John Wiley & Sons, 2000).

James Mauro (T3) is a Senior Staff Engineer in the Performance and Availability Engineering group at Sun Microsystems. Jim's current projects are focused on quantifying and improving enterprise platform availability, including minimizing recovery times for data services and Solaris. He co-developed a framework for system availability measurement and benchmarking and is working on implementing this framework within Sun. Jim co-authored *Solaris Internals: Architecture Tips and Techniques* (Sun Microsystems Press/Prentice Hall, 2000).

Ned McClain (T4, W4), co-founder and CTO of Applied Trust Engineering, was formerly director of Infrastructure Engineering at XOR Inc. In this role, McClain was responsible for the security and performance of more than 200 client network and server environments. Ned speaks regularly at international system administration and networking conferences and is contributing author to both the *UNIX System Administration Handbook* and the *Linux Administration Handbook.* Ned holds a B.S. in computer science from Cornell University.

Richard McDougall (T3), an Established Engineer in the Performance Application Engineering Group at Sun Microsystems, focuses on large systems performance and architecture. He has over twelve years of experience in UNIX performance tuning, application/kernel development, and capacity planning. Richard is the author of many papers and tools for measurement, monitoring, tracing, and sizing UNIX systems, including the memory-sizing methodology for Sun, the MemTool set for Solaris, the recent Priority Paging memory algorithms in Solaris, and many unbundled tools for Solaris, and is co-author of *Solaris Internals: Architecture Tips and Techniques* (Sun Microsystems Press/Prentice Hall, 2000).

Gary McGraw (T1) Cigital Inc.'s CTO, researches software security and sets technical vision in the area of software risk management. Dr. McGraw is co-author of four popular books: *Java Security* (Wiley, 1996), *Securing Java* (Wiley, 1999), *Software Fault Injection* (Wiley 1998), and *Building Secure Software* (Addison-Wesley, 2001). He consults with major e-commerce vendors, including Visa, MasterCard, and the Federal Reserve, functions as principal investigator on several government grants, and serves on commercial and academic advisory boards. Dr. McGraw holds a dual Ph.D. in cognitive science and computer science from Indiana University and a B.A. in philosophy from UVa.

Marshall Kirk McKusick (M8, T8) writes books and articles, consults, and teaches classes on UNIX- and BSD-related subjects. While at the University of California at Berkeley, he implemented the 4.2BSD fast filesystem and oversaw the development and release of 4.3BSD and 4.4BSD. His particular areas of interest are the virtual-memory system and the filesystem. He earned a B.S. in Electrical Engineering from Cornell University. At the University of California at Berkeley, he received Master's degrees in computer science and business administration, and a doctoral degree in computer science. He is past president and a current member of the USENIX Board of Directors and is a member of AAAS, ACM, and IEEE.

Mark Mellis (T6) is a consultant with SystemExperts Corporation. Over the past two years, Mark has assisted several premier Internet companies in responding to major network attacks and has designed and implemented robust infrastructure to limit future exposure. Mark was the Principal of Mellis and Associates, where he provided network consulting services to various high-tech firms. Mark attended the University of Washington, where he studied physics.

Evi Nemeth (T4, W4), a faculty member in computer science at the University of Colorado, has managed UNIX systems for the past 25 years, both from the front lines and from the ivory tower. She is co-author of the *UNIX System Administration Handbook.* Evi is about to get out of the UNIX and networking worlds and explore the real world on a sailboat.

George Neville-Neil (M6) has worked on networking and embedded operating system software for the last five years, most recently as a Senior Member of Technical Staff and TCP/IP Architect at Wind River Systems. He presents seminars on advanced networking subjects regularly at the PerNet colloquia series at San Francisco State University. Currently he has a consulting company working on advanced frameworks for network protocol implementation.

Marcus Ranum (T8, W3) is founder and CTO of NFR Security, Inc. He has been working in the computer/network security field for over 14 years and is credited with designing and implementing the first commercial Internet firewall product. Marcus also designed and implemented other significant security technologies, including the TIS firewall toolkit and the TIS Gauntlet firewall. As a researcher for ARPA, Marcus set up and managed the Whitehouse.gov email server. Widely known as a teacher and industry visionary, he has been the recipient of both the TISC Clue award and the ISSA lifetime achievement award. Marcus lives in Woodbine, Maryland, with his wife, Katrina, and a small herd of cats.

Avi Rubin (M2) is Principal Researcher at AT&T Labs and a member of the Board of Directors of USENIX. He has been researching issues in computer security since 1991. Rubin is the author of two books on computer security: *White-Hat Security Arsenal* (Addison Wesley, 2001) and *Web Security Sourcebook* (with Dan Geer and Marcus Ranum, John Wiley &Sons, 1997). He is the author of dozens of refereed conference and journal papers, and co-authored two chapters of *Peer-to-Peer* (O'Reilly,2001). Rubin is also an Associate Editor of *Electronic Commerce Research Journal.* His latest research project, Publius, a system for circumventing censorship on the Internet, won the Index on Censorship's Freedom of Expression Award.

John Sellens (M4) has been involved in system and network administration since 1986 and is the author of several related USENIX papers and a number of *;login:* articles, including the "On Reliability"series and SAGE booklet. He has a Master's degree in computer science from the University of Waterloo and is a chartered accountant. He is currently the General Manager for Certainty Solutions (formerly known as GNAC) in Toronto. Prior to joining Certainty, John was the Director of Network Engineering at UUNET Canada, and he was a staff member in computing and information technology at the University of Waterloo for 11 years.

Marc Staveley (W6) recently took a position with Soma Networks, where he is applying his 18 years of experience with UNIX development and administration in leading their IT group. Previously Marc has been an independent consultant and has held positions at Sun Microsystems, NCR, Princeton University, and the University of Waterloo. He is a frequent speaker on the topics of standards-based development, multi-threaded programming, system administration, and performance tuning.

John Stewart (W7) is the Chief Security Officer at Digital Island, Inc., a cable and wireless company. Prior to his work at Digital Island, he helped architect Cisco's Web site and worked on the security teams at Cisco and at NASA Ames Research Center. John, who is the co-author of the W3C's "WWW Security FAQ," has been teaching at the SANS and Network Security conferences since 1996 and serves on a number of technical advisory boards. He holds a B.S. and M.S. in computer science from Syracuse University.

Theodore Ts'o (M3) has been a Linux kernel developer since almost the very beginnings of Linux—he implemented POSIX job control in the 0.10 Linux kernel. He is the maintainer and author for the Linux COM serial port driver and the Comtrol Rocketport driver. He architected and implemented Linux's tty layer. Outside of the kernel, he is the maintainer of the e2fsck filesystem consistency checker. Ted is a Senior Technical Staff Member of IBM's Linux Technology Center.

SAGE System Administrator Certification Program

SAGE Certification is now live! SAGE has been developing a new international certification to meet the growing demand for an objective means for evaluating system administrators, as well as to enhance a sense of professionalism and personal development in the field.

SAGE is pleased to announce the launch of SAGE Certification, the first professional certification program developed by and for system administrators. SAGE Certification is a multi-platform program which came into existence, through SAGE, as a response to industry demands for vigorous, job-specific evaluation.

The exams for the first level of certification, called cSAGE, are underway through VUE testing centers worldwide. The cSAGE program, which consists of a core plus a module exam, is focused on junior-level system administrators seeking verifiable validation of their abilities. Senior-level certifications will be developed in the near future. This program assists recent college graduates strengthening their marketability, corporations that want to define more clearly their system administrators' career development plans, and channel partners, resellers, and authorized service provider programs who wish to offer confirmation of their remote site capabilities.

SAGE Certification Founding Corporate Patrons include SAGE, USENIX, TAOS, and UGU. For more information, see the SAGE Certification Web site: **www.sagecert.org**.

SAGE certification
by and for system administrators™

General Track	Invited Talks	FREENIX Track

THURSDAY (day one)

8:45 AM–10:30 AM

Opening Remarks, Awards, and Keynote

Keynote Address: The Internet's Coming Silent Spring
Lawrence Lessig, *Stanford University*

The innovation of the Internet grew out of the network's unique design. Its 'architecture' was built to enable neutral and unrestrained innovation. In this talk, Lawrence Lessig shows how this ecology of innovation is now being undermined by those who were threatened by the original network architecture. Changes to this architecture, and the legal environment within which it lives, will in turn undermine the network's potential.

Professor Lessig, the nation's leading scholar of law and cyberspace, recently formed the Center for Internet and Society at Stanford Law School. The Center aims to examine the relationship between the architecture of cyberspace and the basic constitutional and public policy values that define our democracy.

10:30 AM–11:00 AM Break

11:00 AM–12:30 PM

File Systems
Session Chair: Greg Ganger, *Carnegie Mellon University*

Structure and Performance of the Direct Access File System
Kostas Magoutis, Salimah Addetia, Alexandra Fedorova, and Margo I. Seltzer, *Harvard University*; Jeffrey S. Chase, Andrew J. Gallatin, Richard Kisley, and Rajiv G. Wickremesinghe, *Duke University*; and Eran Gabber, *Lucent*

Conquest: Better Performance Through a Disk/RAM Hybrid File System
An-I A. Wang, Peter Reiher, and Gerald J. Popek, *University of California, Los Angeles*; and Geoffrey H. Kuenning, *Harvey Mudd College*

Exploiting Gray-Box Knowledge of Buffer Management
Nathan C. Burnett, John Bent, Andrea C. Arpaci-Dusseau, and Remzi H. Arpaci-Dusseau, *University of Wisconsin, Madison*

The IETF, or, Where Do All Those RFCs Come from, Anyway?
Steve Bellovin, *AT&T Labs—Research*

What are Internet standards, and where do they come from? What is the real meaning of an RFC? Did a black helicopter really land on the White House lawn? The last topic won't be covered, but you'll hear all you need to know about the IETF (Internet Engineering Task Force) and what it does. More important, you'll hear why you should care, and perhaps even participate.

Building Applications
Session Chair: Chris Demetriou, *Broadcom Corp.*

Interactive 3D Graphics Applications for Tcl
Oliver Kersting and Jüergen Döellner, *Hasso Plattner Institute for Software Systems Engineering, University of Potsdam*

The AGFL Grammar Work Lab
Cornelis H.A. Koster and Erik Verbruggen, *University of Nijmegen (KUN)*

SWILL: A Simple Embedded Web Server Library
Sotiria Lampoudi and David M. Beazley, *University of Chicago*

General Track	Invited Talks	FREENIX Track
12:30 PM–2:00 PM Lunch (on your own)		
2:00 PM–3:30 PM		
Operating Systems (and Dancing Bears) Session Chair: Frank Bellosa, *University of Erlangen-Nürnberg* **The JX Operating System** Michael Golm, Meik Felser, Christian Wawersich, and Jürgen Kleinöder, *University of Erlangen-Nürnberg* **Design Evolution of the EROS Single-Level Store** Jonathan S. Shapiro, *Johns Hopkins University*; and Jonathan Adams, *University of Pennsylvania* **Think: A Software Framework for Component-based Operating System Kernels** Jean-Philippe Fassino, *France Télécom R&D*; Jean-Bernard Stefani, *INRIA*; Julia Lawall, *DIKU*; and Gilles Muller, *INRIA*	**Introduction to Air Traffic Management Systems** Ron Reisman and James Murphy, *NASA Ames Research Center,* and Rob Savoye, *Seneca Software* This introduction to air traffic control systems summarizes the operational characteristics of the principal Air Traffic Management (ATM) domains (i.e., en route, terminal area, surface control, and strategic traffic flow management) and the challenges of designing ATM decision support tools. The Traffic Flow Automation System (TFAS), a version of the Center TRACON Automation System (CTAS), will be examined. TFAS achieves portability across platforms (Solaris, HP/UX, and Linux) by adherence to software standards (ANSI, ISO, POSIX). Software engineering issues related to design, code reuse, portability, performance, and implementation are discussed.	**Network Performance** Session Chair: Craig Metz, *Extreme Networks* **Linux NFS Client Write Performance** Chuck Lever, *Network Appliance, Incorporated*; and Peter Honeyman, *CITI, University of Michigan* **A Study of the Relative Costs of Network Security Protocols** Stefan Miltchev and Sotiris Ioannidis, *University of Pennsylvania*; and Angelos Keromytis, *Columbia University* **Congestion Control in Linux TCP** Pasi Sarolahti, University of Helsinki; and Alexey Kuznetsov, *Institute for Nuclear Research at Moscow*
3:30 PM–4:00 PM Break		
4:00 PM–5:30 PM		
Building Services Session Chair: Jason Nieh, *Columbia University* **Ninja: A Framework for Network Services** J. Robert von Behren, Eric A. Brewer, Nikita Borisov, Michael Chen, Matt Welsh, Josh MacDonald, Jeremy Lau, and David Culler, *University of California, Berkeley* **Using Cohort Scheduling to Enhance Server Performance** James R. Larus and Michael Parkes, *Microsoft Research*	**Adventures in DNS** Bill Manning, *ISI* The Internet Domain Name System is poised for explosive growth in several areas: • adding support for IPv6; • DNS security; • support for alternate character encoding methods. The existing DNS root structure was constructed with some presumptions about the underlying transport protocol that have dictated how the DNS root structure and context have evolved. Our project has constructed and deployed a root context that supports the IPv4 data but introduces new features and protocol support. We have augmented the system with IPv6 and DNSSec records and are discussing how to test alternate encodings. I'll review some preliminary findings and possible ramifications.	**Xtreme Xcitement** Session Chair: Keith Packard, *XFree86 Core Team & SuSE, Inc.* **The Future Is Coming: Where the X Window System Should Go** Jim Gettys, *Compaq Computer Corporation* **XCL: An Xlib Compatibility Layer for XCB** Jamey Sharp and Bart Massey, *Portland State University* **Biglook: A Widget Library for the Scheme Programming Language** Erick Gallesio, *University of Nice – Sophia Antipolis*; and Manuel Serrano, *INRIA Sophia Antipolis*

Technical Sessions *June 13–15*

General Track	Invited Talks	FREENIX Track

FRIDAY (day two)

9:00 AM–10:30 AM

Network Performance
Session Chair: Vern Paxson, *ICIR*

EtE: Passive End-to-End Internet Service Performance Monitoring
Yun Fu and Amin Vahdat, *Duke University*; Ludmila Cherkasova and Wenting Tang, *Hewlett-Packard Laboratories*

The Performance of Remote Display Mechanisms for Thin-Client Computing
S. Jae Yang, Jason Nieh, Matt Selsky, and Nikhil Tiwari, *Columbia University*

A Mechanism for TCP-Friendly Transport-Level Protocol Coordination
David E. Ott and Ketan Mayer-Patel, *University of North Carolina, Chapel Hill*

The Joy of Breaking Things
Pat Parseghian, *Transmeta*

When Transmeta launched the Crusoe microprocessor, how did we assure its compatibility with the x86 architecture? The CPU's layered design poses unique challenges, from the silicon's underlying proprietary architecture through the multiple stages of the Code Morphing Software which executes x86 instructions. This talk will share a testing philosophy and set of practices that can be applied to software products as well as systems or devices.

Hacking in the Kernel
Session Chair: Chuck Cranor, *AT&T Labs—Research*

An Implementation of Scheduler Activations on the NetBSD Operating System
Nathan J. Williams, *Wasabi Systems Inc.*

Authorization and Charging in Public WLANs Using FreeBSD and 802.1*x*
Pekka Nikander, *Ericsson Research NomadicLab*

ACPI Implementation on FreeBSD
Takanori Watanabe, *Kobe University*

10:30 AM–11:00 AM Break

11:00 AM–12:30 PM

Storage Systems
Session Chair: Elizabeth Shriver, *Bell Labs*

My Cache or Yours? Making Storage More Exclusive
Theodore M. Wong, *Carnegie Mellon University*; and John Wilkes, *Hewlett-Packard Laboratories*

Bridging the Information Gap in Storage Protocol Stacks
Timothy E. Denehy, Andrea C. Arpaci-Dusseau, and Remzi H. Arpaci-Dusseau, *University of Wisconsin, Madison*

Maximizing Throughput in Replicated Disk Striping of Variable Bit-Rate Streams
Stergios V. Anastasiadis, *Duke University*; and Kenneth C. Sevcik and Michael Stumm, *University of Toronto*

Technology, Liberty, and Washington
Alan Davidson, *Center for Democracy and Technology*

The open, distributed, end-to-end architecture of today's Internet is becoming a favorite target of policy-makers in the U.S. and around the world. For example, in the wake of the September 11 attacks, new laws and regulations have been proposed in the U.S. to enable greater government monitoring of Internet activity. Concerns about copyright have prompted some to propose government-mandated digital-rights-management security standards. These and other initiatives could directly impact both the architecture of the Internet and the rights of Internet users. This talk will report on the latest Internet security and policy initiatives in Washington and examine their impact on the Internet's architecture and individual liberty.

Analyzing Applications
Session Chair: Jim McGinness, *Consultant*

Gscope: A Visualization Tool for Time-Sensitive Software
Ashvin Goel and Jonathan Walpole, *Oregon Graduate Institute, Portland*

Inferring Scheduling Behavior With Hourglass
John Regehr, *University of Utah*

A Decoupled Architecture for Application-Specific File Prefetching
Chuan-Kai Yang, Tulika Mitra, and Tzi-Cker Chiueh, *Stony Brook University*

12:30 PM–2:00 PM Lunch in the Exhibition Hall

General Track

Invited Talks

FREENIX Track

2:00 PM–3:30 PM

Work-in-Progress Reports
Session Chair: Amin Vahdat, *Duke University*

Short, pithy, and fun, Work-in-Progress reports introduce interesting new or on-going work, and the USENIX audience provides valuable discussion and feedback. A schedule of presentations will be posted at the conference.

See page 25 for complete information on how to submit presentations.

CNN.com: Facing a World Crisis
William LeFebvre, *CNN Internet Technologies*

On September 11, 2001, Net users flocked to news sites. The unexpected and unprecedented demand quickly drove nearly every news site into the ground, and CNN.com was no exception. What brought our site back up was a tremendous effort of teamwork, fast thinking, and troubleshooting. On September 11, with only 85% availability, we nearly equaled our site's all-time high. Next day, we shattered previous site records. This talk tells the story of the CNN.com team that met an unbelievable user demand.

Work-in-Progress Reports
Session Chair: Amin Vahdat, *Duke University*

See the General Track (column 1) for a description of this shared session.

3:30 PM–4:00 PM Break

4:00 PM–5:30 PM

Tools
Session Chair: Christopher Small, *Sun Microsystems*

Simple and General Statistical Profiling with PCT
Charles Blake and Steven Bauer, *Massachusetts Institute of Technology*

Engineering a Differencing and Compression Data Format
David G. Korn and Kiem Phong Vo, *AT&T Labs—Research*

Taking an Open Source Project to Market
Eric Allman, *Sendmail, Inc.*

What happens when a long-time open source project is converted to a commercial model? Some effects are business-oriented and expected: for example, marketing and sales departments appear. Some are less obvious, involving the way engineering is done. Open source sendmail has been the major MTA since 1982. In 1998, as sendmail neared a "success disaster," a commercial company was formed to develop and support sendmail. The focus of this talk will be on engineering, but business issues will also crop up.

Access Control
Session Chair: Robert Watson, *NAI Labs & The FreeBSD Project*

Design and Performance of the OpenBSD Stateful Packet Filter (pf)
Daniel Hartmeier, *Systor AG*

Enhancing NFS Cross-Administrative Domain Access
Joseph Spadavecchia and Erez Zadok, *Stony Brook University*

SATURDAY (day three)

9:00 AM–10:30 AM

Where in the Net . . .
Session Chair: Patrick McDaniel, *AT&T Research*

A Precise and Efficient Evaluation of the Proximity Between Web Clients and Their Local DNS Servers
Zhuoqing Mao, *U.C. Berkeley*; and Charles D. Cranor, Fred Douglis, Michael Rabinovich, Oliver Spatscheck, and Jia Wang, *AT&T–Labs-Research*

Geographic Properties of Internet Routing
Lakshminarayanan Subramanian, U.C. Berkeley; Venkata N. Padmanabhan, *Microsoft Research*; and Randy H. Katz, *U.C. Berkeley*

Providing Process Origin Information to Aid in Network Traceback
Florian P. Buchholz, Purdue University; and Clay Shields, Georgetown University

Information Visualization for Systems People
Tamara Munzner, *Compaq SRC*

By interacting with a carefully designed visual representation of data, people form mental models that help them carry out a specific task more effectively. To meet the daunting design challenge of finding a cognitively useful spatial mapping for an abstract dataset, information visualization draws on ideas from several intellectual traditions, including computer graphics, human-computer interaction, cognitive psychology, semiotics, graphic design, cartography, and art. I will present a survey of information visualization techniques and methods, concentrating on solutions relevant to problems faced by computer systems people.

Engineering Open Source Software
Session Chair: Niels Provos, *University of Michigan*

Ningaui: A Linux Cluster for Business
Andrew Hume, *AT&T Labs—Research*; and Scott Daniels, *Electronic Data Systems Corporation*

CPCMS: A Configuration Management System Based on Cryptographic Names
Jonathan S. Shapiro and John Vanderburgh, *Johns Hopkins University*

X Meets Z: Verifying Correctness in the Presence of POSIX Threads
Bart Massey, *Portland State University*; and Robert T. Bauer, *Rational Software Corporation*

Technical Sessions *June 13–15*

General Track	Invited Talks	FREENIX Track
10:30 AM–11:00 AM Break		
11:00 AM–12:30 PM		
Programming Session Chair: Darrell Anderson, *Duke University* **Cyclone: A Safe Dialect of C** Trevor Jim, *AT&T Labs—Research*; and Greg Morrisett, Dan Grossman, Michael Hicks, James Cheney, and Yanling Wang, *Cornell University* **Cooperative Task Management Without Manual Stack Management** Atul Adya, Jon Howell, Marvin Theimer, Bill Bolosky, and John Douceur, *Microsoft Research* **Improving Wait-Free Algorithms for Interprocess Communication in Embedded Real-Time Systems** Hai Huang, Padmanabhan Pillai, and Kang G. Shin, *University of Michigan*	**Fixing Network Security by Hacking the Business Climate** Bruce Schneier, *Counterpane Internet Security* Network security has long been considered an engineering problem, which companies try to solve by applying technologies. The technologies are failing, and the problem is worsening. What we need are security processes, such as detection, response, and deterrence. However, the only way to get corporate management to adequately address security is to change the risk-management equation. This can be achieved by enforcing penalties for liabilities and giving corporate management the means to reduce or insure against those liabilities. It's only after we do all of these things that the Internet will be a safe and secure place.	**File Systems** Session Chair: Erez Zadok, *SUNY at Stony Brook* **Planned Extensions to the Linux Ext2/Ext3 Filesystem** Theodore Y. Ts'o, *IBM*; and Stephen Tweedie, *Red Hat* **Recent Filesystem Optimisations on FreeBSD** Ian Dowse, *Corvil Networks*; and David Malone, *CNRI Dublin Institute of Technology* **Filesystem Performance and Scalability in Linux 2.4.17** Ray Bryant, *SGI*; Ruth Forester, *IBM;* and John Hawkes, *SGI*
12:30 PM–2:00 PM Lunch on your own		
2:00 PM–3:30 PM		
Mobility Session Chair: Mary Baker, *Stanford University* **Robust Positioning Algorithms for Distributed Ad-Hoc Wireless Sensor Networks** Chris Savarese and Jan Rabaey, *University of California, Berkeley*; Koen Langendoen, *Delft University of Technology* **Application-specific Network Management for Energy-aware Streaming of Popular Multimedia Formats** Surendar Chandra, *University of Georgia*; and Amin Vahdat, *Duke University* **Characterizing and Analyzing Alert and Browse Services of Mobile Clients** Atul Adya, Paramvir Bahl, and Lili Qiu, *Microsoft Research*	**Life in an Open Source Startup** Daryll Strauss, *Consultant* Development is very different for open source companies. Strangers look at your code. You give away large parts of your intellectual property. Demands are made by your users. You're expected to explain your plans and actions. Outsiders contribute code without necessarily understanding the material in depth. The benefits are a better product that better meets the requirements of your users. The development of OpenGL for Linux, a very large and very visible open source project, was a roller coaster ride with a startup company, acquisition, and finally a split, but the project lives on. This talk will debunk some of the myths about open source development and will draw conclusions in the hope of improving experiences for future open source companies.	**Things to Think About** Session Chair: Toon Moene, *GNU Fortran Team* **Speeding Up Kernel Scheduler by Reducing Cache Misses** Shuji Yamamura, Akira Hirai, Mitsuru Sato, Masao Yamamoto, Akira Naruse, and Kouichi Kumon, *Fujitsu Laboratories, LTD* **Overhauling Amd for the '00s: A Case Study of GNU Autotools** Erez Zadok, *Stony Brook University* **Simple Memory Protection for Embedded Operating System Kernels** Frank W. Miller, *University of Maryland, Baltimore County*
3:30 PM–4:00 PM Break		
4:00 PM–5:30 PM		
Special Closing Session: How Flies Fly? Michael H. Dickinson, *Williams Professor, UC Berkeley* Join Professor Dickinson as he shares his fascinating exploration into the flight behavior and aerodynamics of flies. In his research Professor Dickinson uses virtual technology to reconstruct what a fly 'sees' and determine the means by which the fly's nervous system integrates visual and olfactory input to modify aerodynamic forces. This clever fusion of olfactory and visual information produces a robust and efficient search algorithm and should serve as a useful model for control systems in autonomous vehicles.		

The AFS WORKSHOP

Tuesday, June 11–Wednesday, June 12

The AFS Workshop, co-located with the USENIX Annual Technical Conference, brings together administrators and programmers to discuss the development and progress of AFS software, which is growing rapidly both in use and usability.

Previous AFS Workshops have covered such topics as methods of authentication, Multi-Resident AFS [MR-AFS], backups, client stability and configuration, replacing ubik, and future work on OpenAFS and Arla. As some of the key players in both OpenAFS and Arla attend the Workshops, these discussions can and do affect the course of development.

Attendance is limited to 50 people. The cost is $100 for those already registered for the technical sessions at USENIX, and $350 for those who wish to attend the workshop only. Breakfast pastries, lunch, and beverages will be provided.

To apply to attend the AFS Workshop, send email to afs-workshop@psc.edu. Your email must contain at least one of the following:

- A proposal for a short talk to present about work done, in progress, or being considered
- A list of topics you would like discussed, time permitting

Your application must be accepted and you must be registered for the Workshop in order to be admitted.

To register and get the latest updates, see www.usenix.org/events/usenix02/.

Workshop Co-ordinators

Esther Filderman has been working with AFS since its infancy at CMU, before it was called AFS. She is currently Senior Systems Mangler and AFS administrator for the Pittsburgh Supercomputing Center.

Ted McCabe started working with AFS at CMU in the mid-'80s. After a 5-year stint studying mathematics in Boston University's graduate program, he returned to working with AFS at MIT in '96. Ted also represents MIT on the OpenAFS Council of Elders.

Derrick Brashear works for CMU and is an OpenAFS Elder..

The GURU IS IN

Thursday, June 13–Saturday, June 15

Our Guru Is In sessions are informal gatherings which allow you to pose questions to noted experts in the community. This is your opportunity to get practical solutions to your most burning technical questions.

Thursday, 11:00 a.m.–12:30 p.m.

Linux on Laptop/PDA

Bdale Garbee, HP Linux Systems Operation

Bdale currently works at HP helping to making sure Linux will work well on future HP systems. He has worked on both UNIX internals and embedded systems for many years. He helped jump-start ports of Debian GNU/Linux to 5 architectures other than i386, and keeps an impressive number of oddball systems running Linux in his basement just for fun. When he's not busy trying to keep his compute farm running, Bdale's other big hobby is amateur radio, specifically building amateur satellites.

Thursday, 2:00 p.m.–3:30 p.m.

Large Data/Clusters/Resilient Computing

Andrew Hume, AT&T Labs—Research

Andrew Hume has worked at Bell Labs and AT&T for 21 years. Most recently, he has been working on solving very large-scale data problems, using data feeds from legacy systems, on a Linux cluster using resilient computing techniques.

Thursday, 4:00 p.m.–5:30 p.m.

SAMBA—Ins and Outs

Gerald Carter, SAMBA Team / Hewlett-Packard

Gerald Carter has been a member of the SAMBA Team since 1998 and is employed by Hewlett-Packard as a Software Engineer, where he works on Samba-based print appliances. He is currently working on a guide to LDAP for system administrators with O'Reilly Publishing. Gerald holds a master's degree in computer science from Auburn University, where he was also previously employed as a network and system administrator.

Friday, 9:00 a.m.-10:30 a.m.

Developing Portable Applications

Nick Stoughton, MSB Consultants

Nick has been working in this field for over 6 years as a consultant. He has built both internal and external help desk systems for a wide variety of organizations, both in the U.S. and in Europe. His experience covers several leading applications. He also has a wealth of experience in computer telephony integration. When not building help-desk systems, Nick serves as USENIX's Standards Liaison.

Friday, 11:00 a.m.-12:30 p.m.

Automated System Administration

Steve Traugott, TerraLuna, LLC

Steve helped pioneer the term "Infrastructure Architecture" and has worked toward industry acceptance of this SysAdmin++ career track for the last several years. He is a consulting Infrastructure Architect and publishes tools and techniques for automated system administration. His deployments have ranged from financial trading floors and NASA supercomputers to Web farms and growing startups.

Friday, 4:00 p.m.–5:30 p.m.

Network Management, System Performance Tuning

Jeff R. Allen, Tellme Networks, Inc.

Jeff has been working in the Sysadmin field since 1992. He finds himself drawn to running large, complex systems that serve people who don't want to know they are using a computer (therein lies the complexity). He developed tools for the NOC at WebTV Networks, then moved to Tellme Networks, where today he acts as a bridge between engineering and the NOC, interfaces with the European operations team, and solves tricky problems as they arise.

Saturday, 9:00 a.m.–10:30 a.m.

Internet Security, Intranet Security, Mapping Networks

Bill Cheswick, Lumeta Corporation

Ches used to be a programmer from Bell Labs. Now he is a programmer for a Bell Labs startup. He is working hard on the second edition of his book.

Saturday, 11:00 a.m.–12:30 p.m.

General/Random

Jim Gettys, Compaq

Jim helped develop the X Window System. He also edited the HTTP/1.1 spec, and is now messing with Linux handhelds.

Saturday, 2:00 p.m.–3:30 p.m.

Sysadmin Management/General

David Parter, University of Wisconsin, Madison

David has been a system administrator at the University of Wisconsin Computer Science Department for 10 years, serving as Associate Director for the past six. David has been the senior system administrator, guiding a staff of 8 full-time sysdamins, and supervising up to 12 student sysadmins at a time. His experiences in this capacity include working with other groups on campus; providing technical leadership to the group; managing the budget; dealing with vendors; dealing with faculty; and training students. As a consultant, he has dealt with a variety of technical and management challenges. David has also been active in SAGE, serving on several program committees and chairing LISA '99. He currently serves as SAGE President.

Special Conference Features

Birds-of-a-Feather Sessions (BoFs)

Wednesday, Thursday, and Friday evenings, June 12–14

Do you have a topic you'd like to discuss with others? Our Birds-of-a-Feather (BoF) sessions may be perfect for you. These informal and highly interactive evening gatherings are a great way for you to present new work, meet with your peers and maximize your time at the conference. Topics range from highly technical, to fun! Past BoF sessions include:

- Getting Plugged into Sendmail
- BSD Users, Unite!
- UWIN-UNIX for Windows
- Oldtimer's BoF
- Sun-Manager's BOF
- Workplace Issues for Lesbian, Gay, Bisexual, Transgendered Sysadmins & Friends
- How do YOU manage to not get spammed?

Don't miss the famous LINUX BoF with Linus Torvalds and Ted Ts'o on Friday, June 14 from 10pm- midnight.

These sessions are open to all attendees and can be scheduled during the conference at the registration desk or in advance by contacting USENIX (bofs@usenix.org); please include preferred day and time, title of the BoF, and the name, email address, and phone number of the moderator. Check the USENIX '02 Web site for BoF schedule information.

Dessert Reception at the Aquarium

USENIX '02 offers many opportunities for attendees to socialize and get to know each other. Don't miss our special dessert reception on Friday, June 14, at the Monterey Bay Aquarium.

Take advantage of SUPER SAVINGS when you register online for three days of tutorials!

TUTORIAL FEES
One Day Fee: $600
Two Day Fee: $1100
Three Day Fee: $1500 - SAVE $300!

Use our online Web registration form :
SAVE an additional $50!

(A $150 fee will be added to the above rates if registering after May 17.)

Work-in-Progress Reports (WiPs)

Friday, June 14, 2:00 p.m.–3:30 p.m.

Short, pithy, and fun, Work-in-Progress reports introduce interesting new or ongoing work. If you have work you would like to share or a cool idea that's not quite ready for publication, send a one- or two-paragraph summary to usenix02wips@usenix.org. We are particularly interested in presenting students' work. A schedule of presentations will be posted at the conference, and the speakers will be notified in advance. Work-in-Progress reports are five-minute presentations; the time limit will be strictly enforced.

Conference Proceedings

One copy of the Proceedings is included with your technical sessions registration fee. Additional copies may be purchased at the conference. To order additional copies after the conference, see http://www.usenix.org/publications/ordering/, telephone the USENIX Office at 1.510.528.8649, or send email to orders@usenix.org.

Internet Connectivity and Terminal Room Sponsored by Apple Computer

USENIX is pleased to offer Internet connectivity and a terminal room at the Annual Technical Conference. The terminal room will be furnished with G4s running OS X, drops for you to connect your laptop to our switches, and 802.11b wireless connectivity.

During the tutorials the terminal room will offer limited hours of operation covering peak times. On Thursday and Friday we will be open from 7 a.m. until 2 a.m., except for all-inclusive conference functions such as the Opening Session and the Conference Reception. We will close on Saturday at 5:30 p.m.

If you are interested in being a terminal room volunteer in exchange for a free Technical Session registration, please contact Lynda McGinley (mcginley@usenix.org).

Attendee Messages

Telephone messages may be left at the USENIX Message Center Desk, 1.831.646.5312. The Message Center will be open Sunday, June 9, through Saturday, June 15, from 7:30 a.m. until 5:00 p.m.

Messages will be posted on the message board in the Registration area.

Attendee List

Your registration packet will include a list of the names and affiliations of your fellow conference attendees. To protect your privacy, we do not print full contact information. Instead, we offer a Web-based contact service after the conference.

Registration, Hotel, and Travel Information

Registration Information

Early registration deadline: Friday, May 17, 2002

TUTORIAL FEES (JUNE 10–12)

Tutorial registration fees include:

- Admission to the tutorials you select
- Lunch on the day of your tutorial
- Tutorial CD-ROM
- Printed tutorial materials for your courses
- Admission to the Vendor Exhibition

Select only one full-day tutorial per day.

Members/Nonmembers
$600/day
CEU credit (optional) $15/day

Tutorial Multi-Day Discounts
Deduct $100 for two days: $1100 total
Deduct $300 for three days: $1500 total

After May 17, add $150 to the tutorial fee.

Students, with Tutorial Codes
$90/day
CEU credit (optional) $15/day

TECHNICAL SESSIONS FEES (JUNE 13–15)

Technical sessions registration fees include:

- Admission to all technical sessions
- Free USENIX T-shirt
- Copy of Conference Proceedings
- Admission to the Conference Receptions
- Admission to the Vendor Exhibition

Early Registration Fees (before May 17)

Member*	$595
Nonmember**	$695
Student	$100

After May 17, members and nonmembers add $150 to the technical sessions fee.

** The member fee applies to current members of USENIX and EurOpen.SE.*

*** The nonmember fee includes a free one-year membership in the USENIX Association.*

Payment by check or credit card must accompany the registration form. Purchase orders, vouchers, or telephone or email registrations cannot be accepted.

Student Discounts & Stipends

TUTORIALS

A limited number of tutorial seats are reserved for full-time students at the very special rate of $90 for a full-day tutorial. You must email the Conference Dept., conference@usenix.org, to confirm availability and make a reservation. You will be given a code number to use when you register. The Conference Dept. must receive your registration form, with the code number, full payment, and a photocopy of your current student I.D. card, within 14 days from the date you make your reservation, or your reservation will be canceled. This special fee is not transferable.

TECHNICAL SESSIONS

USENIX offers full-time students a special discount rate of $100 for its technical sessions. You must fax a copy of your current student I.D. card to the USENIX Conference Dept. when you register. This special fee is not transferable.

STUDENT STIPENDS

The USENIX student stipend program covers travel, hotel, and registration fees to enable full-time students to attend USENIX meetings. Application information is posted on comp.org.usenix 6–8 weeks before the conference, and is also available at *http://www.usenix.org/students/stipend.html*.

STUDENT MEMBERSHIP

USENIX offers full-time students a special membership rate of $30 a year. Students must provide a copy of current student ID. To join SAGE, the System Administrators Guild, you must be a member of USENIX. Student SAGE membership is an additional $15. Students receive the same member benefits as individual members.
Join when you register by filling out the appropriate line on the print or on-line registration form.

Hotel and Travel Information

Hotel discount reservation deadline: Friday, May 17, 2002

USENIX has negotiated special rates for conference attendees at the Monterey Marriott and the DoubleTree Hotel. Contact a hotel directly to make your reservation as soon as possible. You must mention USENIX to get the special rate. A one-night room deposit must be guaranteed to a major credit card.

Monterey Marriott Hotel
350 Calle Principal, Monterey, CA 93940
Toll-free: 1.800.228.9290
Local telephone: 1.831.649.4234
www.marriott.com

Room Rates (single/double occupancy)
$130.00
(plus taxes, currently at 10.05%)

DoubleTree Hotel
2 Portola Plaza, Monterey, CA 93940
Toll-free: 1.800.222.8733
Local telephone: 1.831.649.4511
www.doubletreemonterey.com

Room Rates (single/double occupancy)
$130.00
(plus taxes, currently at 10.05%)

Note: All requests for hotel reservations made after the May 17 deadline (or after the room block is sold out) will be handled on a space-available basis at the hotel's standard rate.

Need a Roommate?

Usenet facilitates room-sharing. Post to and check *comp.org.usenix.roomshare*.

DISCOUNT AIRFARES

Special discounted airfares have been negotiated with United Airlines:

5% off any published fare on United Airlines, United Express, or Shuttle by United.

10% off coach fares (BUA) when reservations are made in "M" class and utilize the MTGUA Unique Fare Basis Code.

Make reservations through your travel agent or directly with United Airlines at 1.800.521.4041. Refer to Meeting ID Number 510CH.

AIRPORT AND TAXI SERVICE

The Monterey Peninsula Airport is located just four miles from the Conference Center and hotels. Taxi service costs approximately $15 one way.

DRIVING AND PARKING

Please see the conference Web site for directions, and for the many parking options available: www.usenix.org/events/usenix02.

Be sure to make your hotel reservation early. Monterey hotels fill up quickly.

Refund & Cancellation Policy

CANCELLATION DATE: June 5, 2002
All refund requests must be emailed to conference@usenix.org by Wednesday, June 5. You may substitute another in your place.

Registration Questions?

USENIX Conference Department
2560 Ninth St., Suite 215
Berkeley, CA 94710
Phone: 1.510.528.8649 ext. 30
Fax: 1.510.548.5738
Email: conference@usenix.org

Registration Form USENIX '02 June 10–15, 2002

This address will be used for all USENIX mailings unless you notify us in writing.

First name | Last name | First Name for Badge

Job Title | Member Number

Company/Institution

Mail Stop | Mail Address

City | State | Zip | Country

Telephone No. | Fax

Email Address (one only, please) | Priority Code*

*Your Priority Code appears just above the address on the mailing label of this brochure.

Attendee Profile

Would you like to receive email about USENIX activities? ❑ Yes ❑ No

Would you like us to provide your name to carefully selected partners? USENIX does not sell its mailing lists. ❑ Yes ❑No

Would you like to be included on the Attendee list? ❑ Yes ❑ No

Would you like information about onsite childcare? ❑ Yes ❑ No

What is your affiliation (check one):

1. ❑ academic 2. ❑ commercial 3. ❑ gov't 4. ❑ R&D 5. ❑ consultant

What is your role in the purchase decision (check one):

1. ❑ final 2. ❑ specify 3. ❑ recommend 4. ❑ influence 5. ❑ no role

What is your primary job function (check one):

1. ❑ system/network administrator 2. ❑ consultant
3. ❑ academic/researcher 4. ❑ developer/programmer/architect
5. ❑ system engineer 6. ❑ technical manager 7. ❑ student
8. ❑ security 9. ❑ Webmaster 10. ❑ other

How did you *first* hear about this meeting (check one):

1. ❑ Email from USENIX 2. ❑ Conference brochure 3. ❑ comp.org.usenix
4. ❑ USENIX/SAGE Web site 5. ❑ Other newsgroup 6. ❑ Local user group
7. ❑ Ad in *Linux Journal* 8. ❑ Ad in *SysAdmin Magazine*
9. ❑ Colleague 10. ❑ Other

What publications or Web sites do you read related to the topics of this conference? _____

Payment Must Accompany This Form

Payment (U.S. dollars only) must accompany this form. Purchase orders, vouchers, email, or telephone registrations cannot be accepted.

❑ Payment enclosed. Make check payable to **USENIX Conference.**

Charge to my: ❑ VISA ❑ MasterCard ❑ American Express ❑ Discover

Account No. | Exp. Date

Print Cardholder's Name

Cardholder's Signature

FAX YOUR REGISTRATION FORM TO: +1.510.548.5738

CANCELLATION DATE: Wednesday, June 5, 2002
All refund requests must be emailed to *conference@usenix.org* by June 5.

Tutorial Program *(Monday–Wednesday, June 10–12)*

Select only one full-day tutorial per day (9:00 a.m.–5:00 p.m.)

Monday , June 10

❑ M1 Advanced Solaris SysAdmin
❑ M2 Intro to Computer Security
❑ M3 Inside the Linux Kernel
❑ M4 System & Network Monitoring
❑ M5 Sendmail Config. & Operation
❑ M6 Socket Programming
❑ M7 UNIX Security
❑ M8 FreeBSD Kernel Internals, Pt. 1

Tuesday, June 11

❑ T1 Building Secure Software
❑ T2 UNIX Infrastructure Design
❑ T3 Solaris Internals
❑ T4 UNIX and Linux Admin, Pt. 1
❑ T5 Perl for SysAdmin
❑ T6 Real-World Intrusion Detection
❑ T7 Practical UNIX Cryptography
❑ T8 FreeBSD Kernel Internals, Pt. 2

Wednesday, June 12

❑ W1 Blueprints for High Availability
❑ W2 Practical Wireless IP
❑ W3 Building Honey Pots
❑ W4 UNIX and Linux Admin, Pt. 2
❑ W5 Exploring LDAP
❑ W6 System & Network Tuning
❑ W7 Cisco's Security Features
❑ W8 PHP—Scripting the Web

EARLY BIRD TUTORIAL FEES (until May 17)

One day: $600 ..... $_____
Two days: $1100 ..... $_____
Three days: $1500 ..... $_____
CEU fee (optional) ..... $15.00 per day $_____

STANDARD TUTORIAL FEES (after May 17)

One day: $750 ..... $_____
Two days: $1250 ..... $_____
Three days: $1650 ..... $_____
CEU fee (optional) ..... $15.00 per day $_____

STUDENT TUTORIAL FEES (special rate)

CODE NO. _____ ..... $90.00 $_____
CODE NO. _____ ..... $90.00 $_____
CODE NO. _____ ..... $90.00 $_____

Students: Attach a photocopy of current student I.D.

AFS Workshop Fees *(Tuesday–Wednesday, June 11–12)*

$100 with Tech Sessions registration/$350 AFS only ..... $_____

Technical Program *(Thursday–Saturday, June 13–15)*

EARLY BIRD REGISTRATION (until May 17)

Current member fee ..... $595.00 $_____
(applies to individual members of USENIX and EurOpen.SE)
Nonmember fee (includes FREE one-year membership) $695.00 $_____
I do ***NOT*** wish to join USENIX at this time (check here): ❑

STANDARD REGISTRATION (after May 17)

Current member fee ..... $745.00 $_____
(applies to individual members of USENIX and EurOpen.SE)
Nonmember fee (includes FREE one-year membership) $845.00 $_____
I do ***NOT*** wish to join USENIX at this time (check here): ❑

STUDENT REGISTRATION (special rate) $100.00 $_____

Students: Attach a photocopy of current student I.D.

Membership Renewal

Renew your USENIX membership ..... $100.00 $_____
Join or renew your SAGE membership ..... $40.00 $_____
(You must be a current member of USENIX to join SAGE)

STUDENTS:

Join USENIX or renew your student membership ..... $30.00 $_____
Join SAGE or renew your student SAGE membership $15.00 $_____
(You must be a current member of USENIX to join SAGE)
Students: Attach a photocopy of current student I.D.

TOTAL DUE $_____

PLEASE COMPLETE THIS FORM AND RETURN IT, ALONG WITH FULL PAYMENT, TO:

CONFERENCE DEPT., USENIX ASSOCIATION
2560 NINTH ST., SUITE 215
BERKELEY, CA 94710-2565