

2003 USENIX

SPONSORED BY USENIX, THE ADVANCED COMPUTING SYSTEMS ASSOCIATION

Annual Technical Conference

JUNE 9-14, MARRIOTT RIVERCENTER, SAN ANTONIO, TEXAS

Don't miss out!

June 9-11, 2003

14 new technical tutorials, 24 in all, including:

- Implementing LDAP Directories
- Managing Samba 2.2 & 3.0
- Advanced Topics in SysAdmin and Security
- Inside the Linux Kernel
- Bridges, Routers, Switches, and Internetworking Protocols
- Advanced Solaris SysAdmin

June 12-14, 2003

4 tracks of technical sessions
51 refereed technical presentations
9 Invited Talks
9 Guru-is-In Sessions
Work-in-Progress Reports

3 Receptions

Party at Six Flags over Texas

FREENIX Track Highlights

Experiences with Open Source Software:

- Building a Wireless Community Network
- OpenCM
- Free Software and High-Power Rocketry

Invited Talks Highlights

Nanotechnology: As Hardware Becomes Software
Infrastructure for Feature Film Visual Effects
The Future of Wireless Network Security

Free Vendor Exhibition

Birds-of-a-Feather Sessions



Keynote Speaker

Neal Stephenson, author of Snow Crash, The Diamond Age, Cryptonomicon, and the upcoming Quicksilver

USENIX
THE ADVANCED COMPUTING SYSTEMS ASSOCIATION

www.usenix.org/usenix03/

Conference at a Glance

Sunday, June 8

5:00 p.m.–8:00 p.m. On-Site Registration

Monday, June 9

7:30 a.m.–5:00 p.m. On-Site Registration

9:00 a.m.–5:00 p.m. Tutorial Program

Tuesday, June 10

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 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

6:00 p.m.–7:00 p.m. Welcome Meet & Greet

7:00 p.m.–8:00 p.m. Conference Orientation

8:00 p.m.–11:00 p.m. Birds-of-a-Feather Sessions

Thursday, June 12

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 noon–7:00 p.m. Vendor Exhibition

5:30 p.m.–6:30 p.m. Exhibit Hall Happy Hour

7:00 p.m.–11:00 p.m. Birds-of-a-Feather Sessions

Friday, June 13

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

6:00 p.m.–7:30 p.m. Fajita Fiesta

7:30 p.m.–11:00 p.m. Birds-of-a-Feather Sessions

Saturday, June 14

9:00 a.m.–3:30 p.m. Technical Program

3:45 p.m. Depart for Six Flags Fiesta Texas!

San Antonio Marriott Rivercenter

Monday–Saturday
June 9–14, 2003

**FREE Vendor Exhibition
June 12–13**

DISCOUNT DATE!

Early Bird Registration &
Hotel Discount
Deadline:

FRIDAY, MAY 16, 2003

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An Invitation from the Program Chairs



BRIAN NOBLE



EREZ ZADOK

Conference Organizers

Program Chair

Brian Noble, *University of Michigan*

Program Committee

Andrea Arpaci-Dusseau, *University of Wisconsin*

Edouard Bugnion, *VMware*

Vinny Cahill, *Trinity College Dublin*

Jason Flinn, *University of Michigan*

Steve Gribble, *University of Washington*

Geoffrey H. Kuenning, *Harvey Mudd College*

Darrell Long, *UCSC*

Patrick McDaniel, *AT&T Labs—Research*

Vern Paxson, *ICS*

Dave Presotto, *Bell Labs*

Alex Snoeren, *UCSD*

Dawn Song, *CMU*

Marvin Theimer, *Microsoft Research*

Amin Vahdat, *Duke University*

Bennet Yee, *UCSD*

Invited Talks Coordinators

Ted Faber, *USC Information Sciences Institute*

John Ioannidis, *AT&T Labs—Research*

FREENIX Program Chair

Erez Zadok, *Stony Brook University*

FREENIX Program Committee

David Beazley, *The University of Chicago*

Ray Bryant, *SGI*

Chuck Cranor, *AT&T Labs—Research*

Angelos Keromytis, *Columbia University*

Chuck Lever, *Network Appliance*

Bart Massey, *Portland State University*

Keith Packard, *HP Cambridge Research Labs*

Guido van Rooij, *Madison Gurkha*

Robert Watson, *Network Associates
Laboratories & The FreeBSD Project*

Carl Worth, *USC, Information Sciences
Institute*

“The Guru Is In” Coordinator

Lee Damon, *University of Washington*

Dear Colleague,

Please join us at the USENIX Annual Technical Conference. This year’s program continues the USENIX tradition of combining practical experience and expertise with the latest advances in computing research. Come and meet with your peers, learn from the experts, and share your own ideas and perspectives on the issues faced by computing professionals today.

The tutorials feature expert instructors offering techniques and technologies you can put to immediate use. Choose from 24 full-day classes—14 are new this year. Topics include: Managing LDAP Directories; Managing Samba 2.2 & 3.0; Advanced Topics in Sysadmin & Security; Solaris Internals; Inside the Linux Kernel; Network Security; WiFi Security; Intrusion Detection; Disaster Planning; and more.

An outstanding set of refereed technical papers serves as the foundation for the conference. This year 24 excellent papers were selected from 103 submissions. Topics include tools to ease administrative burdens, solutions that provide flexible access to large collections of information, self-tuning system services, practical security infrastructures, and much more.

Reflecting the continued growth and commitment of the open-source software community, the FREENIX refereed track received a record 70 submissions and selected 27. FREENIX continues the tradition of presenting papers on wide-ranging and useful topics covering security and privacy, experiences in developing and deploying open-source software, networking technologies, and a host of work reporting the latest advances in Linux, *BSD, and X11.

Our keynote speaker is **Neal Stephenson**, the author of several novels including *Snow Crash*, *The Diamond Age*, *Cryptonomicon*, and the upcoming *Quicksilver*.

Among the many invited talks are presentations on “Nanotechnology: As Hardware Becomes Software” and “The Infrastructure for Feature Film Visual Effects.”

The Guru Is In sessions give you the opportunity to ask experts for answers on a range of topics. Work-in-Progress reports offer previews of research that is just on the horizon. You can organize your own Birds-of-a-Feather session or join one hosted by groups such as the Linux and *BSD communities.

In addition to the technical sessions, USENIX is known for its “hallway track,” a continuing forum for the exchange of ideas, opinions, and tips of the trade. Receptions, happy hours, and BoFs provide opportunities for deeper interactions. At the close of the conference, USENIX will invade Six Flags Fiesta Texas—the amusement park may never be the same. Join us in San Antonio for an exhilarating conference!

For the USENIX '03 Program Committees,

Brian Noble, *University of Michigan*

Erez Zadok, *Stony Brook University*

Program Chairs

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 USENIX '03 and take valuable skills back to your company or organization.

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

MONDAY

M1 Implementing LDAP Directories NEW

M2 Hacking and Securing Web-Based Applications NEW

M3 Perl for System Administration: The Networking Power Hours NEW

M4 System and Network Performance Tuning

M5 Inside the Linux Kernel (updated for version 2.6)

M6 Network Security Protocols: Theory and Current Standards NEW

M7 Advanced Topics in System Administration and Security NEW

M8 Logging & Security: Building an Enterprise Logging Infrastructure

TUESDAY

T1 Advanced Solaris System Administration Topics

T2 Managing Samba 2.2 & 3.0 NEW

T3 System and Network Monitoring

T4 Building Internet-Facing Systems NEW

T5 Beyond Shell Scripts: 21st-Century Automation Tools and Techniques NEW

T6 Bridges, Routers, Switches, and Internetworking Protocols NEW

T7 Network Security Profiles: A Collection (Hodgepodge) of Stuff Hackers Know About You

T8 Linux-Based Firewalls NEW

TUTORIAL FEES INCLUDE:

- ◆ ADMISSION TO THE TUTORIALS YOU SELECT
- ◆ LUNCH ON THE DAY OF YOUR TUTORIAL
- ◆ 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 WiFi Security: The Trials and Tribulations of Designing, Deploying, and Using WiFi Networks Securely NEW

W2 Solaris Internals: Architecture, Tips, and Tidbits

W3 System and Network Monitoring: Tools in Depth NEW

W4 Building Honey Pots for Intrusion Detection

W5 Advanced Topics in DNS Administration

W6 But Is It UNIX? A Mac OS X Administrator's Survival Guide NEW

W7 Sendmail Configuration and Operation (updated for Sendmail 8.12)

W8 Disaster Planning and Recovery: How to Keep Your Company (and Your Job) Alive 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 9, 2003

M1 Implementing LDAP Directories NEW

Gerald Carter, *Samba Team/Hewlett-Packard*

Who should attend: Both LDAP directory administrators and architects. The focus is on integrating standard network services with LDAP directories. The examples are based on UNIX hosts and the OpenLDAP directory server and will include actual working demonstrations throughout the course.

System administrators today run a variety of directory services, although these are referred to by names such as DNS and NIS. The Lightweight Directory Access Protocol (LDAP) is the up-and-coming successor to the X500 directory and has the promise of allowing administrators to consolidate multiple existing directories into one.

Topics include:

- Replacing NIS domains
- Integrating Samba user accounts
- Authenticating RADIUS clients
- Integrating MTAs such as Sendmail, Qmail, or Postfix
- Creating address books for mail clients
- Managing user access to HTTP and FTP services
- Storing DNS zone information
- Managing printer information

M2 Hacking and Securing Web-Based Applications

NEW

David Rhoades, *Maven Security Consulting*

Who should attend: People who are auditing Web application security, developing Web applications, or managing the development of a Web application.

Although numerous commercial and freeware tools assist in locating network-level security vulnerabilities, these tools

are incapable of locating application-level issues. This course will demonstrate how to identify security weaknesses for Web-enabled services that could be exploited by remote users.

With numerous real-world examples, this course is based on fact and experience, not theory. The material applies to Web portals, e-commerce, online banking, shopping, subscription-based services, and any Web-enabled application.

Topics include:

- Information-gathering attacks: How hackers read between the lines
- User sign-on process: Many sites contain serious flaws which expose them to the threat of bad publicity and loss of customer confidence
- User sign-off process: Are users really signed off?
- OS & Web server weaknesses: buffer overflows and default material
- Encryption: Finding the weakest link
- Session tracking
 - URL rewriting, basic authentication, and cookie: strengths and weaknesses
 - Session cloning, IP hopping, and other subtle dangers
 - A recipe for strong session IDs
- Authentication: server, session, transactional
- Transaction-level issues
 - Hidden form elements
 - Unexpected user input
 - GET vs. POST
 - JavaScript filters
 - Improper server logic

M3 Perl for System Administration: The Networking Power Hours

NEW

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

Who should attend: System and network administrators with at least advanced-beginner to intermediate Perl skills (important prerequisite).

After offering several successful survey courses on using Perl to make system administration easier, it is time to go deeper. In this course we'll take an hour per subject to probe how Perl can be used to work with three different network-related topics. We'll cover the necessary background material to get you jump-started and then dive into the approaches, tools and methods you need to successfully use your existing Perl skills to tame these areas.

Topics include:

- **SNMP:** The Simple Network Management Protocol isn't always so simple to use or understand, but it is ubiquitous. We'll learn how to use Perl to query and configure SNMP versions 1*- and 3*-capable devices like switches, routers, and workstations.
- **Packet Play:** It is not uncommon to have to sniff a network looking for specific packets (or sometimes even produce them yourself). Maybe you're debugging a network service or performing a penetration test. We'll look at both sniffing for specific packets and creating them ourselves from Perl.
- **Network Monitoring and Mapping:** With SNMP and packet skills under our belt, we can begin to approach the hard topic of continuously monitoring a network and displaying the results. This module will tie together the two previous modules and work toward building simple tools to help. We'll also look at some of the more advanced free

tools already built to solve this problem.

- **LDAP:** If you don't already have a directory service running in your environment, chances are you will soon. It is equally likely that this directory service will be built on or be accessible by the Lightweight Directory Access Protocol. We'll see how to use Perl to perform common LDAP operations.
- **Mail:** Perl is an excellent tool for speaking different mail protocols. We'll learn how to use it to send mail with SMTP and perform different mail operations using POP3 and IMAP. Once we know how to receive mail, we'll look at the process of parsing the mail to help us deal with it.
- **Potpourri:** There are so many topics in the networking arena that we bend the one-topic-per-hour rule for the last hour. In this module we'll look at how to parse logs efficiently and effectively, roll your own daemons, and use encrypted transports from Perl.

M4 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'll examine the virtual memory system, the I/O system, and the file system, NFS tuning and performance strategies, common network performance problems, examples of network capacity planning, and application issues. We'll also cover 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
- Server tuning
 - Filesystem and disk tuning
 - Memory consumption and swap space
 - System resource monitoring
 - NFS issues
 - Automounter and other tricks
- Network performance, design, and capacity planning
- Application tuning
 - System resource usage
 - Memory allocation
 - Code profiling
 - Job scheduling and queuing
 - Real-time issues
 - Managing response time

M5 Inside the Linux Kernel (updated for version 2.6)

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 latest release version of the Linux kernel (v. 2.6), it will also address aspects of the development kernel codebase (v. 2.7) where its substance differs from 2.6. 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.

M6 Network Security Protocols: Theory and Current Standards NEW

Radia Perlman, Sun Microsystems

Who should attend: Anyone who wants to understand the theory behind network security protocol design, with an overview of the alphabet soup of standards and cryptography. This tutorial is especially useful for anyone who needs

to design or implement a network security solution, but it is also useful to anyone who needs to understand existing offerings in order to deploy and manage them. Although the tutorial is technically deep, no background other than intellectual curiosity and a good night's sleep in the recent past is required.

First, without worrying about the details of particular standards, we discuss the pieces out of which all these protocols are built.

We then cover subtle design issues, such as how secure email interacts with distribution lists, how designs maximize security in the face of export laws, and the kinds of mistakes people generally make when designing protocols.

Armed with this conceptual knowledge of the toolkit of tricks, we describe and critique current standards.

Topics include:

- What problems are we trying to solve?
- Cryptography
- Key distribution
 - Trust hierarchies
 - Public key (PKI) vs. secret key solutions
- Handshake issues
 - Diffie-Hellman
 - Man-in-middle defense
 - Perfect forward secrecy
 - Reflection attacks
- PKI standards
 - X.509
 - PKIX
- Real-time protocols
 - SSL/TLS
 - IPsec (including AH, ESP, and IKE)
- Secure email
- Web security
 - URLs
 - HTTP, HTTPS
 - Cookies

M7 Advanced Topics in System Administration and Security 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.

This tutorial covers six topics of critical importance to all system administrators and power users.

Topics include:

- Digital forensics tools and techniques: Investigating computer security incidents has become a necessary skill for all system administrators. We'll discuss the secrets of digital forensics, including how to find out what happened without destroying possible evidence. This section will highlight several incident investigation tools and give examples of their use in real-life scenarios.
- Linux kernel tuning: As Linux's popularity in production environments increases, the need for knowledge on tuning a Linux kernel becomes ever so important. Whether it's performance, security, or functionality you're looking to cajole your system into, we'll give you the what to's and the how to's, and even the what you can't's of this rare art.
- Handling digital forensic evidence: Information collected from a digital crime scene must be handled according to a strict set of rules. We'll talk about what you should do with log files, filesystems, and other digital evidence that might be used in court. This section will get you comfortable with all aspects of evidence handling, from secure evidence collection to the chain of custody.
- Stateful firewalls: Keeping up with the latest security technology can be

a challenge, but it is essential to prevent unwanted intrusions. We'll cover the latest in basic firewall technology on both Cisco and Linux platforms. Specific topics covered include context-based access control, reflexive access lists, and stateful filtering using iptables.

- Network intrusion detection systems: New NIDS products are appearing every day. We'll evaluate the strengths and weaknesses of various technologies, and what might work best for your organization. Leave this section with the information you need to select and implement a NIDS solution that's right for you.
- Performance crisis case studies #3: Don't miss the latest episode of this incredibly popular segment! We've taken a new set of real-life system administration performance crises and dissected them, providing insight on how to diagnose and remedy situations that you might someday face. This is a great way to gain practical knowledge in the performance arena.

M8 Logging & Security: Building an Enterprise Logging Infrastructure

Tina Bird, *Stanford University*

Who should attend: System administrators and network managers responsible for monitoring and maintaining the health and well-being of computers and network devices in an enterprise environment. Participants should be familiar with the UNIX and Windows operating systems and basic network security, although some review is provided.

The purpose of this tutorial is to illustrate the importance of a network-wide centralized logging infrastructure, to introduce several approaches to monitoring audit logs, and to explain the types of information and forensics that can be obtained with well-managed logging systems.

Every device on your network—routers, servers, firewalls, application software—spits out millions of lines of audit information a day. Hidden within the data that indicate normal day-to-day operation (and known problems) are the first clues that systems are breaking down, attackers are breaking in, and end users are breaking up. If you manage that data flow, you can run your networks more effectively.

Topics include:

- The extent of the audit problem: how much data are you generating every day, and how useful is it?
- Logfile content: improving the quality of the data in your logs
- Logfile generation: syslog and its relatives, including building a central loghost, and integrating Microsoft Windows systems into your UNIX log system
- Log management: centralizing, parsing, and storing all that data
- Legal issues: what you can do to be sure you can use your logfiles for human resources issues and for legal prosecution

This class won't teach you how to write Perl scripts to simplify your logfiles. It will teach you how to build a log management infrastructure, how to figure out what your log data means, and what in the world you do with it once you've acquired it.

**TUESDAY,
JUNE 10, 2003**

T1 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
 - Filesystems and their uses
 - The /proc filesystem 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

T2 Managing Samba 2.2 & 3.0 **NEW**

Gerald Carter, *Samba Team/Hewlett-Packard*

Who should attend: System administrators who are currently managing Samba servers or are planning to deploy new servers this year. This course will outline the new features of Samba 3.0, including working demonstrations throughout the course session.

Samba is a freely available suite of programs that allows UNIX-based machines to provide file and print services to Microsoft Windows PCs without installing any third-party software on the clients. This allows users to access necessary resources from both PCs and UNIX workstations. As Samba makes its way into more and more network shops all over the world, it is common to see “configuring/managing Samba servers” listed as a desired skill on many job descriptions for network administrators.

Topics include:

- Providing basic file and print services

- Upgrading Samba servers from version 2.2 to 3.0
- Integrating with Windows NT 4.0 and Active Directory authentication services
- Centrally managing printer drivers for Windows clients
- Managing NetBIOS network browsing
- Implementing a Samba primary domain controller along with Samba backup domain controllers
- Migrating from a Windows NT 4.0 domain to a Samba domain
- Utilizing account storage alternatives to smbpasswd (such as LDAP)
- Making use of Samba VFS modules for features such as virus scanning and a network recycle bin

T3 System and Network Monitoring

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.

Participants will leave this tutorial able to immediately start using a number of monitoring systems and techniques that will improve their ability to manage and maintain their systems and networks.

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, Nagios, SNIPS, MRTG, Cricket, etc.)
- Special situations: remote locations, firewalls, etc.
- Monitoring implementation roadmap: policies, practices, notifications, escalations, reporting

T4 Building Internet-Facing Systems **NEW**

Geoff Halprin, *Mitel/E-Smith*

Who should attend: Intermediate to senior software developers and project managers involved in the building and management of modern software systems.

This tutorial provides practical advice on how to design, build, deploy, and manage Internet-facing systems. We examine the core attributes of Internet systems (scalability, reliability, manageability, maintainability, and security), how to architect and build Internet systems, common mistakes and failures in Internet systems, how to deploy Internet systems, and how to manage Internet systems across their life.

Topics include:

- Building Internet-facing applications
 - Defining attributes of Internet-facing systems
 - System architecture: building to cope with change
 - Operations management: building systems to run
 - Common failures (and how to avoid them) of design, development, process, integration, and deployment
- Deploying Internet applications
 - Thinking about deployment: availability considerations, back-end system integration, failure mode analysis, security exposures analysis, production support preparation
 - Business continuity planning

- Managing Internet applications
- System availability planning
 - What does the business need?
 - What are the resource implications?
- Command and control of Internet applications: trust, configuration management, change management, data management
- The critical elements of managing 24x7 operations
 - Network management (how do we know when something went wrong?)
 - Problem diagnosis (what went wrong?)
 - Disaster recovery procedures (how do we resume service?)
 - Change management (how do we minimize the risk of service disruption?)

T5 Beyond Shell Scripts: 21st-Century Automation Tools and Techniques

NEW

Aeleen Frisch, *Exponential Consulting*

Who should attend: System administrators who want to explore new ways of automating administrative tasks. Shell scripts are appropriate for many jobs, but more complex operations will often benefit from sophisticated tools.

Topics include:

- Automating installations
 - Vendor-supplied tools
 - Alternative approaches
 - State-of-the-art package control
 - Heterogeneous environments
- Mark Burgess's cfengine package
 - Basic and advanced configurations
 - Uses—installations & beyond; “self-healing” system configurations; data collection; and more
 - When *not* to use cfengine
- Other tools
 - Expect—automating interactive processes, what to Expect; using

it with other tools; security issues

- Amanda for enterprise backup—prerequisites; configuration; optimizing
- STEM, a new package for automating network operations—the context and tool capabilities; suggested uses; performance and security issues
- Nagios to monitor network and device performance—how it works; sample configurations; extending Nagios
- RRDTool for examining retrospective system data—basic operation; advanced graphing; options for data collection

T6 Bridges, Routers, Switches, and Internetworking Protocols **NEW**

Radia Perlman, *Sun Microsystems*

Who should attend: Anyone who might need to design a protocol, implement a protocol, write network-based applications, or plan or manage a network, or anyone who is just curious about what is really going on under the covers in a network, and how things got the way they are. Anyone with the courage to see things from different angles, and not just parrot orthodoxy. Paradoxically, this tutorial is good as an introduction to people who are incredibly confused by all the terms and don't know where to start, as well as people who have been using this stuff for years, assumed they understood it, and want to see how all the pieces fit.

The concepts of IP addresses, masks, MAC addresses, routing algorithms, domains, switches, bridges, are pervasive when dealing with networks. We all use these terms and configure these things, but what is really going on? What are the implications of choosing a switch vs. a router? What kinds of things can go wrong in a protocol that is misdesigned, misimplemented, or mismanaged? This

tutorial describes the major protocols involved in the network infrastructure. It describes conceptually what goes on in the packet switches (both layer 2/bridges and layer 3/routers), as well as the implications on endnodes. It contrasts connection-oriented approaches such as ATM and MPLS with connectionless approaches such as IPv4 and IPv6. It covers the endnode-visible pieces of layer 3, such as neighbor-discovery and address autoconfiguration. It covers intradomain routing algorithms (distance vector such as RIP and link state such as OSPF or IS-IS) and interdomain (BGP). It describes the spanning tree algorithm used by bridges and switches.

Topics include:

- Layer 2 (MAC) addresses
 - Why 6 bytes?
 - Relation to layer 3 addresses (IP)
- Bridges
 - Basic idea
 - Why it's more powerful than a repeater
 - Station address learning and forwarding
 - Spanning tree
- What are switches? “switched Ethernet”
- Connection-oriented networks: ATM, MPLS
- Connectionless protocols: IPv4, IPv6, and comparison with others
- Neighbor discovery (ARP, DHCP)
- Routing (distance vector vs. link state, interdomain vs. intradomain)
- IP Multicast
- NAT

T7 Network Security Profiles: A Collection (Hodgepodge) of Stuff Hackers Know About You

Brad C. Johnson, *SystemExperts Corp.*

Who should attend: Network, system, and firewall administrators; security auditors and those audited; those responding to intrusions or responsible for applications or systems that might be targets for crackers. Participants should

understand the basics of TCP/IP networking. Examples will use actual tools and will also include small amounts of HTML, JavaScript, and Tcl.

This tutorial will review the ways crackers work, what protocols and tools they use, and a number of current methods and exploits. You'll learn how to generate vulnerability profiles of your systems. Additionally, we'll review some important management policies and issues.

Topics include:

- Profiles: what can an intruder determine about your site remotely?
- Review of profiling methodologies: different "viewpoints" generate different types of profiling information
- Techniques: scanning, online research, TCP/IP protocol "mis"-uses, denial of service, cracking clubs
- Important intrusion areas: discovery techniques, SSL, SNMP, WWW, DNS
- Tools: scotty, strobe, netcat, ISS, SATAN, SAINT, mscan, sscan, queso, curl, Nmap, SSLeay/upget
- Defining management policies to minimize intrusion risk

T8 Linux-Based Firewalls **NEW**

Joshua Jensen, *Red Hat, Inc.*

Who should attend: Network and security administrators who are charged with implementing network security and looking for Linux-related solutions. Attendees should have a basic understanding of TCP/IP and some experience in configuring network services.

This tutorial will offer extensive configuration examples for Linux-based packet firewalls, common scenarios, and overviews of useful tools that will provide valuable solutions. At the completion of the course, attendees should feel confident in their ability to set up and maintain secure networks with flexible

access control. The instructor encourages questions during the presentation.

Topics include:

- Networking overview
- Linux kernel firewall capabilities
- /proc kernel tuning
- Linux 2.4 and Netfilter
 - Table and structure
 - Firewall rules and targets
 - User chains
 - Simple stateful approaches
 - IPChains compatibility
 - Advanced connection tracking
- Performance tuning
- Network address translation
 - Port forwarding
 - Round-robin load balancing
 - SNAT and masquerading
- Sniffers you should fear (and use)
- Traffic monitoring
- Practical solutions to common problems

WEDNESDAY, JUNE 11, 2003

W1 WiFi Security: The Trials and Tribulations of Designing, Deploying, and Using WiFi Networks Securely **NEW**

William A. Arbaugh, *University of Maryland, College Park*

Who should attend: Designers, administrators, and power users of WiFi networks who need to design, deploy, and/or operate a WiFi network. Previous experience with or knowledge of wireless networking is helpful but not required.

This tutorial will present the security problems with current and legacy WiFi equipment, and then explain the more recent and proposed standard changes designed to mitigate and in some cases eliminate those problems, e.g., WiFi Protected Access (WPA) and Robust

Security Network (RSN). Following the explanations, a detailed design example will be presented and the participants will be shown how to design, deploy, and test wireless architectures using legacy, WPA, and RSN equipment.

Finally, participants will be shown how to build and test an architecture using open source software.

Topics include:

- Known attacks against legacy WiFi equipment and the open source tools used for the attacks
- WiFi Protected Access and RSN: what are the changes, and what do they mean?
- Designing a secure WiFi network
- Deploying a secure WiFi network using open source tools
- Testing your WiFi network using open source tools

W2 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 system, 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.

W3 System and Network Monitoring: Tools in Depth **NEW**

John Sellens, *Certainty Solutions*

Who should attend: Network and system administrators ready to implement comprehensive monitoring of their systems and networks using the best of the freely available tools. Participants should

have an understanding of the fundamentals of networking, familiarity with computing and network components, UNIX system administration experience, and some understanding of UNIX programming and scripting languages.

This tutorial will provide in-depth instruction in the installation and configuration of some of the most popular and effective system and network monitoring tools, including Nagios, Cricket, MRTG, and Orca. It will build on the background provided by the introductory "System and Network Monitoring" tutorial, so participants should be familiar with the topics covered in that tutorial.

Participants should expect to leave the tutorial with the information needed to immediately implement, extend, and manage popular monitoring tools on their systems and networks.

Topics include, for Nagios, Cricket, MRTG, and Orca:

- Installation
- Configuration, options, how to manage larger and non-trivial configurations
- Reporting and notifications, proactive and reactive
- Special cases: interesting problems
- How to write scripts or programs to extend functionality
- Dealing effectively with network boundaries and remote sites
- Security concerns, access control
- Ongoing operations

W4 Building Honey Pots for Intrusion Detection

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 sys-

tems 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
 - Getting 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).

W5 Advanced Topics in DNS Administration

Jim Reid, *Nominum*

Who should attend: DNS administrators who wish to extend their understanding of how to configure and manage name servers running BIND9.

Attendees should have some experience of running a name server and be familiar with DNS jargon for resource records, as well as the syntax of zone files and named.conf.

This tutorial will answer the question, “I’ve set up master (primary) and slave (secondary) name servers. What else can I do with the name server?”

Topics include:

- The BIND9 logging subsystem
 - Getting the most from the name server’s logs
- Managing the name server with rndc
- Configuring split DNS: internal and external versions of a domain
 - Using the views mechanism of BIND9 to implement split DNS
- Setting up an internal root server
- Securing the name server
 - Running it chroot()
 - Using access control lists
 - Preventing unwanted access
- Dynamic DNS (DDNS)
 - Dynamic updates with nsupdate
- IPv6
 - Resolving and answering queries with IPv6
 - Setting up A6/DNAME chains and AAAA records to resolve IPv6 addresses
- The Lightweight Resolver Daemon, lwresd
- Secure DNS (DNSSEC)
 - Using Transaction Signatures (TSIG)
 - How to sign zones with dnssec-keygen and dnssec-signzone

W6 But Is It UNIX? A Mac OS X Administrator’s Survival Guide **NEW**

Aleleen Frisch, *Exponential Consulting*

Who should attend: UNIX system administrators who want or need to administer Macintosh systems running Mac OS X and/or Mac OS X Server. Familiarity with standard UNIX system administration concepts and tasks is

assumed. No previous Macintosh experience is necessary.

Experienced Macintosh users who want to learn about system administration tasks in the Mac OS X environment will also benefit from this course.

People very familiar with Mac OS X or with the NeXTSTEP environment will find much of this material to be a review. Note that comparisons with NeXTSTEP will not be made. We will note interactions between the UNIX implementation and the Mac graphical user/administrative environment.

Topics include:

- What is this beast and what’s Darwin (and why should I care?)
 - System architecture
- Basic tasks
 - Installation hints and pitfalls
 - Software packages
 - Startup and shutdown
- Files and filesystems
 - Filesystem layout
 - File types: resource forks, applications, etc.
- User management
 - Users and groups
 - Mac OS X shared domains
 - Managed preferences
- Networking
 - Client configuration
 - Managing standard TCP/IP daemons: DNS, DHCP, NTP, and so on
 - The Mac OS X multiprotocol environment
 - Rendezvous and its implications
- Process management and performance
- Managing funky Mac peripherals and user expectations
- Mac OS X security architecture and implementation

W7 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 DNSes

W8 Disaster Planning and Recovery: How to Keep Your Company (and Your Job) Alive **NEW**

Evan Marcus, *Veritas Software*

Who should attend: Anyone responsible for their organization’s data. Disaster planning is like insurance: nobody wants to talk about it, and everyone runs from the salesmen. But when you need it, you are very glad to have it! And if you don’t have it when you need it, it is too late to do anything about it. Have you ever been robbed or had an accident or a medical emergency? If you had insurance, you did personal disaster planning.

After 9/11, the companies that survived were those that had disaster plans in place. This tutorial will show you what you need to think about, what you need to plan for (and what you can safely avoid), and how you can put a plan into effect if (God forbid!) you ever need to use it.

We will explore the key aspects of developing a disaster recovery plan, including the key components, testing the plan, and some of the technology that can speed recovery, with an eye toward

Tutorials/Instructors *Mon.-Wed., June 9-11*

balancing cost and benefit. We will also take a close look at one organization that recovered completely very quickly after 9/11.

Topics include:

- What a DR plan should contain
- The costs of developing a DR plan
- Do you need a DR plan at all?
- The legal and civil liabilities of not having a plan
- Downtime and data loss as two sides of the same coin
- Four different methods for testing your DR plan
- DR as a subset of high availability
- Methods and technologies for protecting data through a disaster
- How disasters might affect the people who are responsible for recovery
- Building and staffing DR teams
- The role of senior management in DR
- Convincing management that a DR plan is necessary
- A real-life case study of a company that survived the 9/11 disaster

INSTRUCTORS

Eric Allman (W7) 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.



William Arbaugh (W1) has spent over 15 years performing security research and engineering. Arbaugh and his students were among the first to identify security flaws in the IEEE 802.11 standard, as well as several proposed fixes to the standard. He and his students are actively involved in the IEEE and the IETF standards processes, doing their best to ensure that future standards are more robust. He and Jon Edney are the authors of a forthcoming book (Addison-Wesley, Fall 2003) entitled *Wi-Fi Protected Access: Wireless Security and 802.11*.



Tina Bird (M8), as a Computer Security Officer for Stanford University, works on the design and implementation of security infrastructure; providing security alerts for the 40,000-host network; health-care information security; and extending Stanford's logging infrastructure. Tina moderates the Log Analysis and VPN mailing lists; with Marcus Ranum, she runs www.loganalysis.org. Tina has a B.S. in physics from the University of Notre Dame and a master's degree and Ph.D. in astrophysics from the University of Minnesota.



David N. Blank-Edelman (M3) is the Director of Technology at the Northeastern University College of Computer Science and the author of the O'Reilly book *Perl for System Administration*. He has spent the last 16 years as a system/network administrator in large multi-platform environments, including Brandeis University, Cambridge Technology Group, and the MIT Media Laboratory. He has served as Senior Technical Editor for the *Perl Journal*.



Gerald Carter (M1, T2), 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 system administrator. He 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).



Aleen Frisch (T5, W6) has been a system administrator for over 20 years. She currently looks after a pathologically heterogeneous network of UNIX and Windows systems. She is the author of several books, including *Essential System Administration* (now in its 3rd edition).



Peter Baer Galvin (T1) is the Chief Technologist for Corporate Technologies, 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 coauthor of the *Operating Systems Concepts* and the *Applied Operating Systems Concepts* textbooks. Peter has taught tutorials on security and system administration and has given talks at many conferences and institutions.



Geoff Halprin (T4) has over 25 years of experience in building software systems, from system management tools to network monitoring software and embedded mission-critical billing systems for Internet Service Providers. He has spent more years troubleshooting other peoples programs than he cares to remember. Geoff is also president of SAGE: The System Administrators Guild.



Trent Hein (M7) is co-founder of Applied Trust Engineering. 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.



Joshua Jensen (T8) was the first Red Hat instructor and examiner, and has been with Red Hat for 4 years. In that time he has written and maintained large parts of the Red Hat curriculum: Networking Services and Security, System Administration, Apache and Secure Web Server Administration, and the Red Hat Certified Engineer course and exam. Joshua has worked with Linux for 7 years, and has been teaching Cisco Internetworking and Linux courses since 1998.



Brad C. Johnson (T7) is vice president of SystemExperts Corporation. He has participated in seminal industry initiatives such as the Open Software Foundation, X/Open, and the IETF, and has published often about open systems. Brad has served as a technical advisor to organizations such as Dateline NBC and CNN on security matters. He is a regular tutorial instructor and conference speaker on topics related to practical network security, penetration analysis, middleware, and distributed systems. Brad holds a B.A. in computer science from Rutgers University and an M.S. in applied management from Lesley University.





Evan Marcus (W8) is a Senior Systems Engineer and High Availability Specialist with VERITAS Software Corporation. Evan has more than 14 years of experience in UNIX system administration. While working at Fusion Systems and OpenVision Software, Evan worked to bring to market the first high-availability software application for SunOS and Solaris. 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 (W2) 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 (M7), co-founder and CTO of Applied Trust Engineering, lectures around the globe on applying cutting-edge technology in production computing environments. Ned holds a B.S. in computer science from Cornell University and is a contributing author to both the *UNIX System Administration Handbook* and the *Linux Administration Handbook*.



Richard McDougall (W2), 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 measuring, 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).



Evi Nemeth (M7) has retired from the computer science faculty at the University of Colorado, where she administered UNIX systems, both from the trenches and from the ivory tower. She is a co-author of the *UNIX System Administration Handbook* (now in its 3rd edition) and its green cousin, the *Linux Administration Handbook*. Evi is slowly learning what "retired" is supposed to mean, as she spends more time on her sailboat

in the Caribbean and less time on computers, networks, and security.



Radia Perlman (M6, T6) is a Distinguished Engineer at Sun Microsystems. She is known for her contributions to bridging (spanning tree algorithm) and routing (link state routing), as well as security (sabotage-proof networks). She is the author of *Interconnections: Bridges, Routers, Switches, and Internetworking Protocols*, and co-author of *Network Security: Private Communication in a Public World*, two of the top 10 networking reference books, according to *Network Magazine*. She is one of the 25 people whose work has most influenced the networking industry, according to *Data Communications Magazine*. She holds about 50 issued patents, an S.B. and S.M. in mathematics and a Ph.D. in computer science from MIT and an honorary doctorate from KTH, the Royal Institute of Technology in Sweden.



Marcus Ranum (W4) 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 Maryland with his wife, Katrina, and a small herd of cats.



Jim Reid (W5) started using a PDP11/45 running V7 UNIX 21 years ago and has been working with UNIX systems ever since. He worked for three years at Origin on behalf of Philips Electronics, where he wrote a DNS management system and designed, built, and ran the DNS infrastructure for the corporate network, one of the biggest in the world. He has over a decade's experience in writing and teaching training courses ranging from kernel internals, through system administration and network security, to DNS administration. He's a frequent speaker at conferences and workshops in Europe and the U.S. His book on DNS administration with BIND9 will be published in 2002.



David Rhoades (M2) is president of Maven Security Consulting Inc. Since 1996 David has been providing information protection services for various Fortune 500 customers. His work has taken him across the United States, and to Europe and Asia, where he has lectured and consulted in various areas of information security. David holds a B.S. in computer engineering from Pennsylvania State University and is an instructor for the SANS Institute, the MIS Training Institute, and Sensecurity (based in Singapore).



John Sellens (T3, W3) has been involved in system and network administration since 1986 and is the author of several related USENIX papers, a number of *.login:* articles, and SAGE booklet #7, *System and Network Administration for Higher Reliability*. He holds an M.S. 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 was a staff member in computing and information technology at the University of Waterloo for 11 years.



Marc Staveley (M4) works at Soma Networks, where he is applying his 18 years of experience with UNIX development and administration in leading their IT group. Previously Marc had been an independent consultant, and he has also 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.



Theodore Ts'o (M5) 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.

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General Track

Invited Talks

FREENIX Track

THURSDAY (day one)

8:45 AM–10:30 AM

OPENING REMARKS, AWARDS, AND KEYNOTE



KEYNOTE ADDRESS BY NEAL STEPHENSON,
 AUTHOR OF *CRYPTONOMICON*, *SNOW CRASH*, *THE DIAMOND AGE*,
 AND THE UPCOMING *QUICKSILVER*

10:30 AM–11:00 AM **BREAK**

11:00 AM–12:30 PM

ADMINISTRATION MAGIC

Undo for Operators: Building an Undoable E-mail Store

Aaron Brown and David Patterson, *University of California, Berkeley*

Role Classification of Hosts Within Enterprise Networks

Godfrey Tan, *Massachusetts Institute of Technology*; Massimiliano Poletto, *Mazu Networks*; John Gutttag and Frans Kaashoek, *Massachusetts Institute of Technology*

A Cooperative Internet Backup Scheme

Mark Lillibridge, *Hewlett-Packard Labs*; Sameh Elnikety, *Rice University*; Andrew Birrell, Mike Burrows, and Michael Isard, *Microsoft Research*

ENGINEERING REUSABLE SOFTWARE

LIBRARIES

Kiem-Phong Vo, *AT&T Labs—Research*

Libraries are integral to software development. Successful libraries arguably achieve the right balance among these software engineering dimensions:

1. requirement, i.e., fulfilling the correct anticipated needs;
2. architecture, i.e., being easily composable with others and evolvable as new requirements surface; and
3. scalability, i.e., using efficient algorithms and providing further means to customize and compose them for performance. This talk relates software engineering lessons learned by the speaker while writing a number of widely used libraries.

NETWORK SERVICES

Session Chair: Robert Watson, *Network Associates Laboratories & The FreeBSD Project*

Implementation of a Modern Web Search Engine Cluster

Maxim Lifantsev and Tzi-cker Chiueh, *Stony Brook University*

CSE: A C++ Servlet Environment for High-Performance Web Applications

Thomas Gschwind and Benjamin A. Schmit, *Technische Universität Wien*

U-P2P: A Peer-to-Peer Framework for Universal Resource Sharing and Discovery

Neal Arthorne, Babak Esfandiari, and Aloke Mukherjee, *Carleton University*



June 12–14 Technical Sessions

General Track	Invited Talks	FREENIX Track
12:30 PM–2:00 PM LUNCH ON YOUR OWN		
2:00 PM–3:30 PM		
<p>POWER</p> <p>Currentcy: A Unifying Abstraction for Expressing Energy Heng Zeng, Carla Ellis, Alvin Lebeck, and Amin Vahdat, <i>Duke University</i></p> <p>Design and Implementation of Power-Aware Virtual Memory Hai Huang, Padmanabhan Pillai, and Kang G. Shin, <i>University of Michigan</i></p>	<p>THE CONVERGENCE OF UBIQUITY: THE FUTURE OF WIRELESS NETWORK SECURITY William A. Arbaugh, <i>University of Maryland, College Park</i></p> <p>Computing devices are shrinking while becoming more powerful. At the same time, several forms of wireless networking are experiencing exponential growth. What happens when these two trends converge, and what does it mean for security? This talk will provide a short (and pitiful) history of wireless network security, followed by the speaker's view of the future of wireless network security and what security challenges must be solved before true ubiquitous computing can emerge.</p>	<p>MAIL Session Chair: Carl Worth, <i>University of Southern California</i></p> <p>GNU Mailman, Internationalized Barry Warsaw, <i>Pythonlabs at Zope Corporation</i></p> <p>ASK: Active Spam Killer Marco Paganini</p> <p>Learning Spam: Simple Techniques for Freely Available Software Bart Massey, Mick Thomure, Raya Budrevich, and Scott Long, <i>Portland State University</i></p>
3:30 PM–4:00 PM BREAK		
4:00 PM–5:30 PM		
<p>GET VIRTUAL</p> <p>Operating System Support for Virtual Machines Samuel King and Peter Chen, <i>University of Michigan</i></p> <p>A Multi-User Virtual Machine Grzegorz Czajkowski and Laurent Daynes, <i>Sun Microsystems</i>; Ben Titzer, <i>Purdue University</i></p>	<p>INFRASTRUCTURE FOR FEATURE FILM VISUAL EFFECTS, OR, HERDING CATS IN A THUNDERSTORM Wook, <i>Consultant</i></p> <p>Contemporary feature film visual effects generally require a large digital (CGI—Computer Generated Imagery) component. The peculiar economics of this sector and how to scale to provide near-real-time response in addition to generating and integrating complex image sets will be discussed. The major infrastructure issues in this talk have to do with networking, multi-terabyte storage, the futility of backup, distributed processing, and asset management. A brief tangent on software for film restoration will be included.</p>	<p>NETWORK PROTOCOLS Session Chair: Chuck Cranor, <i>AT&T Labs—Research</i></p> <p>Network Programming for the Rest of Us Itamar Shtull-Trauring, <i>Zoteca</i>; Glyph Lefkowitz, <i>Twisted Matrix Labs</i></p> <p>In-Place Rsync: File Synchronization for Mobile and Wireless Devices David Rasch and Randal Burns, <i>Johns Hopkins University</i></p> <p>NFS Tricks and Benchmarking Traps Daniel Ellard and Margo Seltzer, <i>Harvard University</i></p>



General Track

Invited Talks

FREENIX Track

FRIDAY (day two)

9:00 AM-10:30 AM

NEEDLES AND HAYSTACKS

A Logic File System

Yoann Padioleau, *IRISA Rennes*; Olivier Ridoux, *University of Rennes*

Application-Specific Delta-Encoding via Resemblance Detection

Fred Douglass and Arun Iyengar, *IBM T.J. Watson*

Opportunistic Use of Content Addressable Storage for Distributed File Systems

Niraj Tolia, *Carnegie Mellon U. and Intel Research*; Michael Kozuch, *Intel Research*; Mahadev Satyanarayanan, *Carnegie Mellon U. and Intel Research*; Brad Karp, *Intel Research*; Thomas Bressoud, *Denison U. and Intel Research*

HOW TO BUILD AN INSECURE SYSTEM OUT OF PERFECTLY GOOD CRYPTOGRAPHY

Radia Perlman, *Sun Microsystems Laboratories*

Problems in network security systems tend not to be subtle mathematical flaws in the cryptography, but instead broader system issues. This talk discusses deployed systems or standards with such flaws. It includes a public-key-based system with no advantages over a secret-key-based system, one in which encryption was used where what was really needed was integrity protection, one in which adding security decreased the reliability and did nothing to enhance the security of the system, unmanageable or unscalable PKI models, and an email standard that allowed forging signatures.

BIOS AND VIRTUAL DEVICES

Session Chair: Guido van Rooij, *Madison Gurkha*

Flexibility in ROM: A Stackable Open Source BIOS

Adam Agnew and Adam Sulmicki, *University of Maryland at College Park*; Ronald Minnich, *Los Alamos National Labs*; William Arbaugh, *University of Maryland at College Park*

Console over Ethernet

Mike Kistler, Eric van Hensbergen, and Freeman Rawson, *IBM Austin Research Laboratory*

Implementing Clonable Network Stacks in the FreeBSD Kernel

Marko Zec, *University of Zagreb*

10:30 AM-11:00 AM BREAK

11:00 AM-12:30 PM

CHANGE IS CONSTANT

System Support for Online Reconfiguration

Craig A. N. Soules, *Carnegie Mellon University*; Jonathan Appavoo and Kevin Hui, *University of Toronto*; Dilma Da Silva, *IBM T.J. Watson*;

Gregory R. Ganger, *Carnegie Mellon University*; Orran Krieger, *IBM T.J. Watson*; Michael Stumm, *University of Toronto*; Robert W. Wisniewski, Marc Auslander, Michal Ostrowski, Bryan Rosenburg, and Jimi Xenidis, *IBM T.J. Watson*

Checkpoints of GUI-based Applications

Victor C. Zandy and Barton P. Miller, *University of Wisconsin*

CUP: Controlled Update Propagation in Peer-to-Peer Networks

Mema Roussopoulos and Mary Baker, *Stanford University*

THE NPACI ROCKS CLUSTER TOOLKIT: BREAKING THE MYTH OF HOMOGENEOUS CLUSTERS

Philip Papadopoulos, *San Diego Supercomputer Center*

The Rocks toolkit allows users to stand up small, medium, and large-scale x86 and IA64 clusters in a short period of time. It starts with the assumption that clusters are heterogeneous in both hardware and functionality. Rocks decomposes the configuration of nodes (termed appliances) into small, reusable building blocks that include both software package and configuration information. Using a graph construction, shared configuration information across appliance types can be easily expressed. Utilizing the extensive hardware probing of modern OS installers, heterogeneous nodes become no harder to support than assumed homogeneous nodes. Installation and reinstallation performance figures will be given.

FILE SYSTEMS

Session Chair: Chuck Lever, *Network Appliance*

StarFish: Highly Available Block Storage

Eran Gabber, Jeff Fellin, Michael Flaster, Fengrui Gu, Bruce Hillyer, Wee Teck Ng, Banu Ozden, and Elizabeth Shriver, *Lucent Technologies, Bell Labs*

Secure and Flexible Global File Sharing

Stefan Miltchev, *University of Pennsylvania*; Vassilis Prevelakis, *Drexel University*; Sotiris Ioannidis, *University of Pennsylvania*; John Ioannidis, *AT&T Labs—Research*; Angelos D. Keromytis, *Columbia University*; Jonathan M. Smith, *University of Pennsylvania*

The Cryptographic Disk Driver

Roland C. Dowdeswell, *The NetBSD Project*; John Ioannidis, *AT&T Labs—Research*

12:30 PM-2:00 PM LUNCH ON YOUR OWN

June 12-14 Technical Sessions

General Track	Invited Talks	FREENIX Track
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2:00 PM-3:30 PM

SECURITY MECHANISMS

The Design of the OpenBSD Cryptographic Framework

Angelos D. Keromytis, *Columbia University*;
Jason L. Wright and Theo de Raadt, *OpenBSD Project*

NCryptfs: A Secure and Convenient Cryptographic File System

Charles P. Wright, Michael C. Martino, and Erez Zadok, *Stony Brook University*

A Binary Rewriting Defense Against Stack-based Buffer Overflow Attacks

Manish Prasad and Tzi-cker Chiueh, *Stony Brook University*

ALTERNATIVE TOP-LEVEL DOMAINS (A.K.A. THE GAME OF THE NAME)

Steve Hotz, *New.net*

Naming is a fundamental concept for systems architects, a critical decision for marketers, and a requirement for operating networked computers. Quite simply, we care about names. Consequently, it is no surprise that control of the DNS, the primary Internet namespace, is a morass of highly charged technical, financial, legal, and political issues. This talk discusses issues surrounding alternative top-level domains, and the somewhat controversial approach New.net has taken to expanding the operational DNS namespace.

X WINDOW SYSTEM

Session Chair: Bart Massey, *Portland State University*

Xstroke: Full-Screen Gesture Recognition for X

Carl Worth, *University of Southern California*

Matchbox: Window Management Not for the Desktop

Matthew Allum, *OpenedHand Ltd.*

X Window System Network Performance

Keith Packard and James Gettys, *HP Cambridge Research Labs*

3:30 PM-4:00 PM

BREAK

4:00 PM-5:30 PM

WORK-IN-PROGRESS REPORTS

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.

SATURDAY (day three)

9:00 AM-10:30 AM

FAST SERVERS

Kernel Support for Faster Web Servers

Marcel C. Rosu and Daniela Rosu, *IBM T.J. Watson*

Multiprocessor Support for Event-Driven Programs

Nickolai Zeldovich, *Stanford University*;
Alexander Yip, Frank Dabek, and Robert T. Morris, *Massachusetts Institute of Technology*;
David Mazières, *New York University*; Frans Kaashoek, *Massachusetts Institute of Technology*

MODELING THE INTERNET

Harry DeLano and Peter H. Salus, *Matrix NetSystems*

It's a bird! It's a plane! Look! Up in the sky . . .

If no one could agree on Superman, no wonder we aren't quite certain what the Internet looks like when it goes home to Smallville and takes off its Clark Kent suit. Thirty years ago, when the ARPANet had well under 50 hosts, the diagram was easy; 20 years ago, when the number was 400, it could still be mastered. But today there are well over 200 million hosts.

Several different approaches are currently being pursued to represent the structure and population of the Internet, and much of the data is muddled and inconsistent. Thus, part of the challenge is to gather it into a coherent representation of what's out there.

EXPERIENCES

Session Chair: Keith Packard, *HP Cambridge Research Labs*

Building a Wireless Community Network in the Netherlands

Rudi van Drunen, Dirk-Willem van Gulik, Jasper Koolhaas, Huub Schuurmans, and Marten Vijn, *Wireless Leiden Foundation*

OpenCM: Early Experiences and Lessons Learned

Jonathan S. Shapiro, John Vanderburgh, and Jack Lloyd, *Johns Hopkins University*

Free Software and High-Power Rocketry: The Portland State Aerospace Society

James Perkins, *Wind River Systems*; Andrew Greenberg and Bart Massey, *Portland State University*

General Track	Invited Talks	FREENIX Track
10:30 AM–11:00 AM BREAK		
11:00 AM–12:30 PM		
<p>BIG DATA</p> <p>Seneca: Remote Mirroring Done Write Minwen Ji, Alistair Veitch, and John Wilkes, <i>Hewlett-Packard Labs</i></p> <p>Eviction-based Cache Placement for Storage Caches Zhifeng Chen and Yuanyuan Zhou, <i>University of Illinois at Urbana-Champaign</i>; Kai Li, <i>Princeton University</i></p> <p>Fast, Scalable Disk Imaging with Frisbee Mike Hibler, Leigh Stoller, Jay Lepreau, Robert Ricci, and Chad Barb, <i>University of Utah</i></p>	<p>NANOTECHNOLOGY: AS HARDWARE BECOMES SOFTWARE J. Storrs Hall, <i>Institute for Molecular Manufacturing</i></p> <p>Designing a microprocessor has more in common with programming than it does with designing a steam engine. Similar tools—specification languages, simulators, rule checkers, profilers—and a similar level of complexity dominate over the distinction between matter and bits as the output. As nanotechnology advances to the point where we can specify and construct large, atomically precise systems, the same will become true of nanomachine design. This talk will describe such systems and the process of designing them.</p>	<p>PRIVILEGE MANAGEMENT Session Chair: Angelos D. Keromytis, <i>Columbia University</i></p> <p>POSIX Access Control Lists on Linux Andreas Gruenbacher, <i>SuSE Linux AG</i></p> <p>Privman: A Library for Partitioning Applications Douglas Kilpatrick, <i>Network Associates Laboratories</i></p> <p>The TrustedBSD MAC Framework: Extensible Kernel Access Control for FreeBSD 5.0 Robert Watson, Brian Feldman, Adam Migus, Wayne Morrison, and Chris Vance, <i>Network Associates Laboratories</i></p>
12:30 PM–2:00 PM LUNCH ON YOUR OWN		
2:00 PM–3:30 PM		
<p>I/O GUESSING GAMES</p> <p>Robust, Portable I/O Scheduling with the Disk Mimic Florentina I. Popovici, Andrea C. Arpaci-Dusseau, and Remzi H. Arpaci-Dusseau, <i>University of Wisconsin</i></p> <p>Controlling your PLACE in the File System with Gray-box Techniques James Nugent, Andrea C. Arpaci-Dusseau, and Remzi H. Arpaci-Dusseau, <i>University of Wisconsin</i></p> <p>Operating System I/O Speculation: How Two Invocations Are Faster Than One Keir Fraser, <i>University of Cambridge Computer Laboratory</i>; Fay Chang, <i>Google Inc.</i></p>	<p>TO BE ANNOUNCED</p>	<p>KERNEL Session Chair: Ray Bryant, <i>SGI</i></p> <p>Using Read-Copy-Update Techniques for System V IPC in the Linux 2.5 Kernel Andrea Arcangeli, <i>SuSE</i>; Mingming Cao, Paul McKenney, and Dipankar Sarma, <i>IBM</i></p> <p>An Implementation of User-level Restartable Atomic Sequences on the NetBSD Operating System Gregory McGarry</p> <p>Providing a Linux API on the Scalable K42 Kernel Jonathan Appavoo, <i>University of Toronto</i>; Marc Auslander, Dilma Da Silva, David Edelsohn, Orran Krieger, Michal Ostrowski, Bryan Rosenburg, Robert W. Wisniewski, and Jimi Xenidis, <i>IBM T.J. Watson</i></p>
3:30 PM–3:45 PM BREAK		
3:45 PM–9:30 PM		
<p>SIX FLAGS FIESTA TEXAS</p> <p>When the technical program ends on Saturday afternoon, get ready to play for the rest of the day! Board a shuttle bus with your friends to fun-filled Six Flags Fiesta Texas, a 200-acre family theme park with over 60 rides and attractions. This event will be fun for the entire family.</p> <p>Your registration fee covers one admission ticket and a voucher good at six casual restaurants in the park. Additional tickets may be purchased onsite at a special discounted price.</p>		

THE GURU IS IN

Thursday, June 12–Saturday, June 14

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.

PKI/Cryptography

Greg Rose, QUALCOMM, Inc.

Greg Rose is a VP of Technology for QUALCOMM International, based in Australia, where he works on cryptographic security and authentication for third-generation mobile phones and other technologies. He holds a number of patents for cryptographic methods and has successfully cryptanalyzed widely deployed ciphers. Some of his papers and free software are available at <http://people.qualcomm.com/ggr/QC>.

Thursday, 2:00 p.m.–3:30 p.m.

Legacy Systems/Big Data/Freenix Clusters

Andrew Hume, AT&T Labs—Research

Andrew Hume is a Technology Consultant in AT&T Labs' software systems research department. He has worked in the areas of software tools, pattern matching and string searching, processing massive datasets, and, most recently, cajoling high availability and performance from clusters of UNIX PCs.

Thursday, 4:00 p.m.–5:30 p.m.

Linux

Bdale Garbee, HP Linux and Open Source Lab/Debian Project Leader

Bdale is the Debian Project Leader and currently works at HP helping to make sure Linux will work well on future HP systems. His background includes many years of both UNIX internals and embedded systems work. He helped jumpstart ports of Debian GNU/Linux to 5 architectures other than i386.

Friday, 9:00 a.m.–10:30 a.m.

Release Engineering in a Large Distributed Project

Scott Long, FreeBSD Project

Scott's experience with FreeBSD dates back to the fall of 1992, when he discovered 386BSD-0.1. Since obtaining his src commit privileges in 2000, he has contributed to and maintained RAIDframe, the UDF filesystem, and several hardware drivers. In November 2002 he joined the FreeBSD Release Engineering team and quickly assumed the lead for the 5.0 release. He is currently working with the FreeBSD community to define the path for the 5.x series. His day job is as a software engineer for Adaptec, Inc., writing Linux and FreeBSD drivers and doing Open Source evangelism.

Friday, 11:00 a.m.–12:30 p.m.

X, Fonts, 2D Graphics

Keith Packard, HP Cambridge Research Labs

Keith Packard has been a member of the XFree86 core team for the last few years, building a new rendering system for X applications. Before joining Hewlett-

Packard, he worked at the MIT X Consortium. He has worked with the X window system since 1986.

Friday, 2:00 p.m.–3:30 p.m.

Databases

Keith Bostic, Sleepycat Software

Keith Bostic was a member of the Berkeley Computer Systems Research Group, where he was the architect of the 2.10BSD release and a principal developer of the 4.4BSD and related releases. He co-designed and implemented the 4.4BSD log-structured filesystem and the Berkeley DB database library. He is currently vice-president of engineering at Sleepycat Software.

Saturday, 9:00 a.m.–10:30 a.m.

Web Hosting

Jan Saell, EurOpen.se

Jan Saell is a UNIX consultant operating both in Sweden and internationally. His company, Irial, provides advanced UNIX and network consultancy. He is currently the chairman of EurOpen.SE. He has been working in the UNIX environment since 1983.

Saturday, 11:00 a.m.–12:30 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 since 1991, serving as Associate Director of the Computer Systems Lab since 1995, guiding a staff of 8 fulltime sysadmins 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.

Saturday, 2:00 p.m.–3:30 p.m.

AFS

Esther Filderman, Pittsburgh Supercomputing Center, and Garry Zacheiss, MIT

Having worked for Carnegie Mellon University since 1988, Esther has been working with AFS since its toddlerhood and is currently a Senior Systems Mangler and AFS administrator for the Pittsburgh Supercomputing Center. Esther has been helping to bring AFS content to USENIX conferences since 1997.

Garry Zacheiss has spent four years working for MIT Information Systems doing both development and system administration. As a member of the Athena Server Operations team, he works on maintaining and expanding the AFS cells used by Athena, MIT's Academic Computing Environment.

THE AFS WORKSHOP

Tuesday, June 10–Wednesday, June 11

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, 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.

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

Further information can be found at <http://www.psc.edu/~ecf/afs-workshop/>.

Attendance is limited to 40 people. Your application must be accepted and you must be registered for the Technical Conference in order to be admitted.

To register and get the latest updates, see <http://www.usenix.org/usenix03/>.

Workshop Coordinators

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.

Garry Zacheiss works with AFS at MIT as a member of the Athena Server Operations team. He also works with the OpenAFS project as a Gatekeeper. His spare time is spent living in sin with a quasi-sentient omnipotent relational database.

Derrick Brashear is a systems programmer with the Computing Services division of Carnegie Mellon University and is on the OpenAFS Council of Elders, the guiding body for OpenAFS development. He claims to have his fingers in too many pies.

USENIX AND SAGE THANK THEIR SUPPORTING MEMBERS

USENIX Supporting Members

- ❖ Atos Origin B.V. ❖ Freshwater Software ❖ Interhack Corporation ❖ The Measurement Factory ❖
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SAGE Supporting Members

- ❖ Certainty Solutions ❖ Collective Technologies ❖ Freshwater Software ❖
- ❖ Microsoft Research ❖ RIPE NCC ❖

Six Flags Fiesta Texas

*SIX FLAGS FIESTA TEXAS
SATURDAY, JUNE 14
3:45 p.m. – 9:30 p.m.*



When the technical program ends on Saturday afternoon, get ready to play for the rest of the day! Board a shuttle bus with your friends to fun-filled Six Flags Fiesta Texas, a 200-acre family theme park with over 60 rides and attractions. Enjoy a variety of rollercoasters including the awesome Superman Krypton Coaster, the twisted track Poltergeist, the forwards and backwards looping Boomerang, and the old favorite, Wooden Rattler. Free-fall from a 20-story tower on Scream, get soaked on the river rapids ride, or catch a giant wave in the Texas-shaped pool that generates 4-foot waves every few minutes. (Note: In the waterpark, closed-toe beach shoes are recommended. Clothing with rivets is not allowed.)

With gentler rides for the children, Looney Tunes characters, and the new Scooby-Doo Ghostbusters—The Mystery of the Haunted Mansion, this event will be fun for the entire family.

Your registration fee covers one admission ticket and a voucher good at six casual restaurants in the park. Additional tickets may be purchased onsite at a special discounted price.

Vendor Exhibition

MARRIOTT RIVERCENTER

THURSDAY, JUNE 12, 12 NOON–7:00 P.M.

FRIDAY, JUNE 13, 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

LAST YEAR'S EXHIBITORS:

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

www.cert.org

CMP Media

www.cmp.com

Compaq Computer

www.compaq.com

Enlighten Software

www.enlightendsm.com

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 Catherine Allman, cat@usenix.org.

FREE EXHIBIT ADMISSION PASS at <http://www.usenix.org/usenix03/>

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

Special Conference Features

Birds-of-a-Feather Sessions (BoFs)

Wednesday, Thursday, and Friday evenings, June 11–13

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 the value of your time at the conference. Topics range from highly technical to fun! Past BoF sessions have included:

- SuperBSD, led by Kirk McKusick
- XFree86
- User Authentication Sucks: What Can We Do?

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 '03 Web site for BoF schedule information.

Welcome Meet & Greet

Wednesday, June 11, 6:00 p.m.–7:00 p.m.

Enjoy light refreshments while reconnecting with friends and colleagues.

Exhibit Hall Happy Hour

Thursday, June 12, 5:30 p.m.–6:30 p.m.

Visit the Vendor Exhibition, enjoy snacks with hosted beer and wine, and learn about the latest products and technologies.

Fajita Fiesta

Friday, June 13, 6:00 p.m.–7:30 p.m.

Socialize with your fellow attendees over casual eats and hosted beer and wine.

Six Flags Fiesta Texas

Saturday, June 14, 3:45 p.m.–9:30 p.m.

When the technical program ends on Saturday afternoon, board a shuttle bus with your friends to fun-filled Six Flags Fiesta Texas, a 200-acre family theme park with over 60 rides and attractions. Your registration fee covers one admission ticket and a voucher good at six casual restaurants in the park. Additional tickets may be purchased onsite at a special discounted price.

Work-in-Progress Reports (WiPs)

Friday, June 13, 4:00 p.m.–5:30 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 usenix03wips@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/>.

Bring Your Laptop!

USENIX is pleased to offer complimentary Internet access via an 802.11b wireless network in the main meeting areas of the conference. A limited number of Cisco Aironet 4800 PCMCIA cards are available for check-out (with a credit-card guarantee) at the registration desk. We strongly recommend that attendees bring their own.

The network provides a NATed RFC1918 private IP address behind a basic firewall. NAT breaks some VPN clients, so please consult your network administrator for configuration information. Please send e-mail to wireless@usenix.org if a particular set of ports must be open on the firewall for your VPN to work. The network is not secure, and attendees are encouraged to use encryption.

For those who do not wish to use the wireless network, USENIX provides a laptop drop room with Ethernet connections. For those without laptops, the hotel's Business Center offers computer rental.

Attendee Messages

Telephone messages may be left at the USENIX Message Center Desk, 1.210.223.1000. The Message Center will be open Sunday, June 8, through Saturday, June 14, 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 controlled-access Web-based contact service after the conference.

Registration, Hotel, and Travel Information

REGISTRATION INFORMATION

**Early registration deadline:
Friday, May 16, 2003**

TUTORIAL FEES (JUNE 9-11)

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.

Online Early Bird Rates with Multi-Day Discounts (members & nonmembers)

One day: \$575

Two days: \$1100

Three days: \$1525

CEU credit (optional): \$15/day

After May 16, add \$150 to the tutorial fee.

Standard Early Bird Rates with Multi-Day Discounts (members & nonmembers)

One day: \$625

Two days: \$1150

Three days: \$1575

CEU credit (optional): \$15/day

After May 16, add \$150 to the tutorial fee.

Students, with Tutorial Codes

\$150/day

CEU credit (optional): \$15/day

TECHNICAL SESSIONS FEES (JUNE 12-14)

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

Online Early Registration Fees (before May 16)

Member*: \$645

Nonmember**: \$755

Student member: \$310

Student nonmember: \$350

After May 16, members and nonmembers (not students) add \$150 to their technical sessions fee.

* For current members of USENIX, EurOpen.SE, and NUUG.

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

Refund & Cancellation Policy

CANCELLATION DATE: June 3, 2003
All refund requests must be emailed to conference@usenix.org by Tuesday, June 3. You may substitute another in your place.

STUDENT DISCOUNTS & STIPENDS

TUTORIALS

A limited number of tutorial seats are reserved for full-time students at the very special rate of \$150 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 \$310 for its technical sessions for student members and \$350 for student nonmembers. 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. For application information, check comp.org.usenix 6-8 weeks before the conference or see <http://www.usenix.org/students/stipend.html>.

STUDENT MEMBERSHIP

USENIX offers full-time students a special membership rate of \$40 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.

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

HOTEL AND TRAVEL INFORMATION

**Hotel discount reservation deadline:
Friday, May 16, 2003**

USENIX has negotiated special rates for conference attendees at the Marriott Rivercenter. Please make your reservation as soon as possible by contacting the hotel directly and mentioning USENIX to get the special group rate. A one-night room deposit must be guaranteed to a major credit card. To cancel your reservation, notify the hotel at least 48 hours prior to your planned arrival date.

Marriott Rivercenter

101 Bowie Street, San Antonio, TX 78205

Toll-free: 1.800.648.4462

Local telephone: 1.210.223.1000

Fax: 1.210.554.6248

Online reservations:

<http://www.marriott.com>, with these codes:

useusea (single or double room)

useuseb (triple room)

useused (quad room)

Room Rates

\$175 single/\$192 double

(plus taxes, currently at 16.75%)

Note: When the rooms in the USENIX block are sold out, requests will be handled on a space-available basis at the hotel's standard rate. Make your reservations early!

Need a Roommate?

If you wish to share a room, post to comp.org.usenix.roomshare.

TRANSPORTATION TO/FROM SAN ANTONIO

By Air: The San Antonio International Airport is approximately 8 miles from the hotel. Shuttle service is \$9 to the downtown district, \$16 round trip. Taxi service is \$15 to \$17 to downtown.

By Train: Amtrak has daily and weekly passenger rail service to and from San Antonio. The Texas Eagle route offers daily service connecting San Antonio to Austin, Fort Worth, Dallas, and other cities north to Chicago, Illinois. The Sunset Limited route serves San Antonio three times a week, running east and west between Miami, Florida, and Los Angeles, California.

By Car: Take 281 (North or South) to the Commerce Street Exit. The San Antonio Marriott RiverCenter Hotel is on the corner of Bowie and Commerce. The San Antonio Marriott RiverCenter Hotel offers valet parking for hotel guests only. The rate of \$19 for 24 hours does not include in-and-out privileges. Self-parking garages along Bowie Street charge \$5 to \$10 per day.

By Bus: Greyhound Bus Terminal, 210-270-5824

Public Transit: VIA Metropolitan Transit, 210-362-2020

Registration Form

USENIX '03

June 9-14, 2003

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? (does not include address or email) Yes No
 Do you have special meal needs? Vegan Vegetarian Kosher
 Will you be attending the Six Flags Fiesta Texas? Yes No Maybe

What is your affiliation (check one):

1. academic 2. commercial 3. gov't 4. 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. Technical manager 6. Student 7. System engineer
 8. Security 9. Webmaster 10. Other

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

1. Email from USENIX 2. Conference brochure 3. Colleague
 4. Newsgroup 5. Local user group 6. Web site

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

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FAX YOUR REGISTRATION FORM TO: +1.510.548.5738

CANCELLATION DATE: Tuesday, June 3, 2003

All refund requests must be emailed to conference@usenix.org by June 3. You may substitute another in your place.

Tutorial Program (Monday-Wednesday, June 9-11)

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

Monday, June 9

- | | |
|---|---|
| <input type="checkbox"/> M1 Implementing LDAP Directories | <input type="checkbox"/> M5 Inside the Linux Kernel (2.6) |
| <input type="checkbox"/> M2 Securing Web-Based Apps | <input type="checkbox"/> M6 Network Security Protocols |
| <input type="checkbox"/> M3 Perl for SysAdmin: Networking | <input type="checkbox"/> M7 Advanced SysAdmin & Security |
| <input type="checkbox"/> M4 System & Network Tuning | <input type="checkbox"/> M8 Logging & Security |

Tuesday, June 10

- | | |
|--|--|
| <input type="checkbox"/> T1 Advanced Solaris SysAdmin | <input type="checkbox"/> T5 Beyond Shell Scripts |
| <input type="checkbox"/> T2 Managing Samba 2.2 & 3.0 | <input type="checkbox"/> T6 Bridges, Routers, Switches |
| <input type="checkbox"/> T3 System & Network Monitoring | <input type="checkbox"/> T7 Network Security Profiles |
| <input type="checkbox"/> T4 Building Internet-Facing Systems | <input type="checkbox"/> T8 Linux-Based Firewalls |

Wednesday, June 11

- | | |
|--|--|
| <input type="checkbox"/> W1 WiFi Security | <input type="checkbox"/> W5 Advanced DNS Administration |
| <input type="checkbox"/> W2 Solaris Internals | <input type="checkbox"/> W6 Mac OS X Administration |
| <input type="checkbox"/> W3 Monitoring: Tools in Depth | <input type="checkbox"/> W7 Sendmail Config. (8.12) |
| <input type="checkbox"/> W4 Building Honey Pots | <input type="checkbox"/> W8 Disaster Planning & Recovery |

Tutorial Fees

Members and Nonmembers

Days	Fee to May 16	Fee after May 16	CEU fee
1 day	\$625	\$775	\$15
2 days	\$1150	\$1300	\$30
3 days	\$1575	\$1725	\$45

Students (with registration code)

Days	Fee to May 16	Fee after May 16	CEU fee
1 day	\$150	\$150	\$15
2 days	\$300	\$300	\$30
3 days	\$450	\$450	\$45

Total tutorial fee from schedule above \$ _____
 Total CEU fee from schedule above \$ _____

Students must include photocopy of current student I.D. and supply codes:

CODE NO.
 CODE NO.
 CODE NO.

Technical Program Fees (Thursday-Saturday, June 12-14)	Fee to May 16	Fee after May 16
Member Fee (applies to individual members of USENIX, EurOpen.SE, or NUUG)	\$695	\$845
Nonmember Fee Includes complimentary one-year USENIX membership (value \$110): <input type="checkbox"/> Accept <input type="checkbox"/> Decline	\$805	\$955
Student Member (you must include a photocopy of current student I.D.)	\$310	\$310
Student Nonmember (you must include a photocopy of current student I.D.) Includes complimentary one-year USENIX membership (value \$40): <input type="checkbox"/> Accept <input type="checkbox"/> Decline	\$350	\$350

Membership Fees	
One Year USENIX Membership	\$110
One Year USENIX Membership, Student Rate (you must include a photocopy of current student I.D.)	\$40
One Year SAGE Membership (you must be a current member of USENIX to join SAGE)	\$40
One Year SAGE Membership, Student Rate (you must be a current member of USENIX to join SAGE)	\$15

TOTAL DUE \$ _____

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