

**NordU** 2001  
**USENIX**



NordU2001 – The third NordU/USENIX Conference  
February 12–16, 2001  
Norra Latin, Stockholm, Sweden

## Invitation Program

<http://www.nordu.org/NordU2001/>



*FUUG*



# NYA VÄRLDAR NYA KOPPARMOTORER NYA SERVVRAR

[@server]

*För nästa generation e-business.*



**Ny teknik, som den andra generationen kopparchip, gör de nya IBM servrarna till en av de kraftfullaste serverfamiljerna i världen.** IBMs vetenskapsmän och ingenjörer har nu fulländat kopparchipet. Resultatet är en av de snabbaste serverfamiljerna

i världen, byggda för att driva e-business till nya, högre nivåer. Nu har IBM dessutom försett den nya generationen av kopparchip med den nya kisel-på-isolator (SOI) tekniken. Resultatet är att farten skruvats upp med ytterligare 30%. Snart kommer även nya tillverkningsmetoder med högeffektiva isolationsmaterial, som både förbättrar prestanda och sänker energiförbrukningen, och nya revolutionerande tekniker som kraftigt ökar minneskapaciteten (MXT). IBM förvandlar forskning och utveckling till nya produkter som hjälper dig och ditt företag att flytta fram positionerna inom e-business. Du finner ny avancerad teknik i alla nya IBM servrar. För mer information, gå in på [ibm.com/eserver/se](http://ibm.com/eserver/se)

▶ Den nya IBM @server pSeries 680 med koppar och SOI teknik. En av världens mest kraftfulla UNIX-servrar för e-business.<sup>1</sup>

<sup>1</sup>Baserat på en kombination av SPECweb99 och SPECjbb2000 benchmark mätningar den 20/09/00. Se [www.spec.org](http://www.spec.org) för detaljer. IBM erkänner nämnda varumärken och deras ägare. © IBM Corporation 2000.

# Hello and Welcome to NordU2001

It is dawn for humanity. Slowly the new free operating systems are rising, lighting up the earth after a long dark night.

Enough of this. I know that this is the first conference in the year 2001 and by the end of the year, I am sure that all of us are quite tired of the “2001: The Space Odyssey” theme. It is hard to avoid the fun and play with words like this, and you will see that we are sort of using this as a theme during the conference.

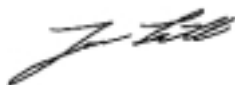
This is the third time we are running the NordU Conference and the event seems to be of more importance every year. More people are aware of its existence and the vendors are showing a lot of interest. I guess that this is, in part, due to the fact that there is not really any other “real” Unix exhibition around anymore, and the other fact might be that all the free operating systems are being subject to more and more interest and use.

This year we have expanded the conference and the tutorials are now running for three days, and hopefully this will give you the opportunity to attend the tutorial you want. One of my favorites this year is the “Kernel internals” tutorial from Marshall Kirk McKusick that will span over three days. A real in-depth tutorial for all of you that want to write drivers and/or understand how the kernel works internally. As usual we will have a strong focus on security with tutorials about LDAP, VPN, Microsoft Active Directory, Sendmail, Apache configuration, Perl and PHP, samba, DNS and security. A lot to pick from. The conference will have an exciting program with a number of talks on different subjects, such as Operating systems, Free Unix/Open Source and Storage Area Networks.

New for this year is the BoFs giving you the opportunity to discuss common topics of interest. Please send information and we can schedule a BoFs for you (see page 31).

Beside the conference and the tutorials we offer a number of social events, with the conference party at The Royal Palace as the big attraction (see page 31). So get together with your friends and meet us all in the nice and friendly environment of NordU2001.

Welcome to the third NordU Conference in Stockholm, February 12–16, 2001 and I hope to see you there!



Jan Säll, Chairman, European.Se and Conference Chair





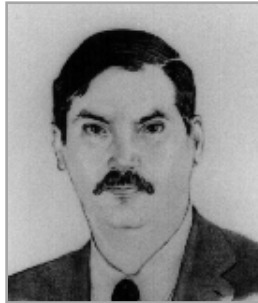
# Program at a Glance

Tutorials			Conference Technical Sessions		
Monday, February 12	Tuesday, February 13	Wednesday, February 14	Thursday, February 15	Friday, February 16	
09.00–17.00 MTW1 Free BSD Kernel Internals: Data Structures, Algorithms, and Networking Marshall Kirk McKusick  09.00–17.00 M2 Windows NT and UNIX Integration: Problems and Solutions Phil Cox and Gerald Carter  09.00–17.00 M3 LDAP – Past, Present and Future Roland Hedberg  09.00–17.00 M4 Secure Networking – An Introduction to VPN Architecture & Implementation Tina Bird  09.00–17.00 M5 Tutorial on Performance Tuning, Workload Analysis, and Capacity Planning Techniques Adrian Cockcroft  09.00–12.30 M6-1 Microsoft Active Directory an Island unto Itself? Rolf Aberg  13.30–17.00 M6-2 System Software that Exploits SAN Capabilities Paul Massiglia  17.00–21.00 BoFs	09.00–17.00 MTW1 Continued  09.00–17.00 Tu2 Sendmail Configuration and Operation – Updated for Sendmail 8.11 Eric Allman  09.00–17.00 Tu3 Advanced Topics in Perl Programming Daniel V. Klein  09.00–17.00 Tu4 Apache – Advanced Simon Kenyon  09.00–17.00 Tu5 PHP: Scripting the Web Rasmus Lerdorf	09.00–17.00 MTW1 Continued  09.00–17.00 W2 DNS, its Extensions and BIND Lars-Johan Liman  09.00–17.00 W3 Advanced CGI Techniques Daniel V. Klein  09.00–17.00 W4 Configuring and Administering Samba Servers Gerald Carter  09.00–17.00 W5 Network Security profiles: A Small Collection (Hodgepodge) of what Stuff Hackers know about you Brad C. Johnson  18.00– Welcome Reception  17.00–18.00 20.00–21.00 BoFs	<div>Session 1</div> <div>Theme: Operating Systems</div> <div>10.20–11.05 Th1 The Linux/JA64 Project Stephanie Eranian</div> <div>11.05–11.50 Th2 NFS Version 4 Revealed Brian Pawlowski and Spencer Shepler</div> <div>Theme: Free UNIX/Open Source</div> <div>13.00–13.45 Th3 Too little, too slow; Memory Management in Practice Rik van Riel</div> <div>13.45–14.30 Th4 Fast routing in Linux Jamal Hadi Salim and Robert Olsson</div> <div>15.00–15.40 Th5 FreeBSD – The Hidden Power behind the Internet Poul-Henning Kamp</div> <div>15.40–16.20 Th6 Linux High Speed Networking Jes Sorensen</div> <div>16.20–17.00 Th7 GNOME Technologies in Real-World Applications Frederico Mena-Quintero</div> <div>17.00–19.00 BoFs</div> <div>Session 2</div> <div>Theme: Storage Area Network, SAN</div> <div>10.20–11.05 Th8 Solving the Problem of Distributed Resource Management Mikael Holmqvist</div> <div>11.05–11.50 Th9 Business without Interruption with SAN and Clustering Solutions Erik Möller</div> <div>Theme: Refereed Papers</div> <div>13.00–13.35 Th10 Building High-availability Webhosting Solutions using the GNU/Linux Operating System and Commodity Hardware Kenneth Geckshirt, Per Gøterup, and Jacob Thomsen</div> <div>13.35–14.10 Th11 Sniffing the Snuffers – Detecting Passive Protocol Analyzers Jon Baldock and Craig Duffly</div> <div>14.10–14.45 Th12 Certificate Transformation and Authorization in Ad Hoc Networks Catharina Candolin, Janne Lundberg and Hannu H. Kari</div> <div>15.15–15.50 Th13 Client Effects Brian Pawlowski</div> <div>15.50–16.25 Th14 NDMP, Past, Present and Future Harald Skardal</div> <div>16.25–17.00 Th15 Applying Decentralized Trust Management to DNS Dynamic Updates Pasi Eronen and Jonna Särs</div> <div>Session 3</div> <div>Theme: Software Development</div> <div>10.20–11.05 Th16 EJB Enterprise Java Beans Simon Kenyon</div> <div>Theme: Storage Area Networks, SAN</div> <div>11.05–11.50 Th17 SAN or NAS, a Holy War not Worth Fighting Björn Fridborn</div> <div>Theme: Sponsors Presentations</div> <div>13.00–13.35 Th18 DocBook for Free Software Projects Nik Clayton</div> <div>13.35–14.10 Th19 Hitachi Data Networks: Information Infrastructure for the Enterprise Vincent Franceschini</div> <div>14.10–14.45 Th20 Linux Standard Base and Open Source Quality Control Based on LSB's Test Suites Magnus Runesson</div> <div>15.15–15.50 Th21 Compaq Alphaserver and Tru64 UNIX-Platform for the next Generation of Switches at Ericsson Jon Reveman</div> <div>15.50–16.25 Th22 SGI Modular Computing – IRIX and Linux for High Performance Computing Kristian Wedberg</div> <div>19.00– Historical evening at Livrustkammaren (Royal Armoury, The Royal Palace, Stockholm)</div> <div>Session 1</div> <div>Theme: Security</div> <div>08.30–09.15 F1 Network Security Profiles: A Small Collection (Hodgepodge) of what Stuff Hackers know about you Brad C. Johansson</div> <div>09.15–10.00 F2 Kerberos: Principles and Use Assar Westerlund</div> <div>10.20–11.05 F3 Virus – Only one Part of the Problem Staffan Olsén</div> <div>11.05–11.50 F4 Panel Discussion Spam and the Spam Prevention Chairman: Eric Allman</div> <div>Session 2</div> <div>Theme: Software Development</div> <div>08.30–09.15 F5 Project Kylix (Delphi for Linux) and Builder - Native Rapid Application Development Göran Källmark</div> <div>09.15–10.00 F6 Distributed Software Development Matthias Kalke Dalheimer</div> <div>Theme: Mobile Computing</div> <div>10.20–11.05 F7 TCP and UDP in the Mobile World, or what is wrong with Mobile IP Version 6, and how to fix it Pekka Nikander</div> <div>11.05–11.50 F8 Bluetooth Catharina Candolin</div> <div>13.00–15.00 Keynote in Plenum and Closing Ceremony How can Communication and Information Technology Contribute to my Life? Finn E. Olsen</div>		

# Tutorials Monday, February 12, 09.<sup>00</sup>–17.<sup>00</sup>

## MTW1 FreeBSD Kernel Internals: Data Structures, Algorithms, and Networking

*Instructor: Dr. Marshall Kirk McKusick, Author and Consultant*



Marshall Kirk McKusick writes books and articles, consults, and teaches classes on UNIX- and BSD-related subjects. While at the University of California at Berkeley, he implemented the 4.2BSD fast file system, and was the Research Computer Scientist at the Berkeley Computer Systems Research Group (CSRG) overseeing the development and release of 4.3BSD and 4.4BSD. His particular areas of interest are the virtual-memory system and the filesystem. He earned his undergraduate degree in Electrical Engineering from Cornell University, and did his graduate work at the University of California at Berkeley, where he received Masters degrees in Computer Science and Business Administration, and a doctoral degree in Computer Science. He is a past president and current board member of the USENIX Association, and is a member of AAAS, ACM, and IEEE.

### Who should attend:

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

### Abstract:

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

The presentations will emphasize code organization, data structure navigation, and algorithms. It will not cover the machine specific parts of the system such as device drivers.

### Day 1 morning – Kernel Overview

- Kernel terminology
- Basic kernel services
- Process structure

### Day 1 afternoon – Kernel Resource Management

- Virtual memory management
- Paging and swapping
- Scheduling
- Signals

### Day 2 morning – Kernel I/O structure

- Special files
- Terminal handling
- Multiplexing I/O
- Autoconfiguration strategy
- Structure of a disk device driver

### Day 2 afternoon – Filesystems

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

### Day 3 morning – Interprocess Communication

Concepts and terminology

Basic IPC services

Example use of IPC and network facilities

### Day 3 afternoon – Networking Implementation

System layers and interfaces

Routing issues

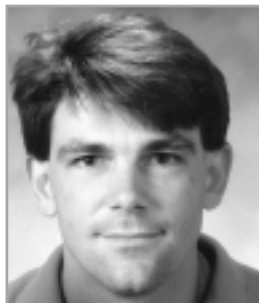
Internet protocols (TCP/IP)

### Course Text

Marshall Kirk McKusick, Keith Bostic, Michael J Karels, and John S. Quarterman, “The Design and Implementation of the 4.4BSD Operating System”, Addison-Wesley Publishing Company, Reading, Massachusetts, 1996, 608 pages.

## M2 Windows NT and UNIX Integration: Problems and Solutions

*Instructors: Phil Cox, Consultant for System-Experts Corporation and Gerald Carter, VA Linux Systems*



Phil Cox frequently writes and lectures on issues bridging the gap between UNIX and Windows NT. He is a featured columnist in ;login;, the magazine of USENIX & SAGE, and has served on numerous USENIX program committees. He is the lead author of the “Windows 2000 Security Handbook” by Osborne McGraw-Hill (published fall of 2000). Phil holds a B.S. in computer science from the College of Charleston, South Carolina.

Gerald Carter is employed by VA Linux Systems and a member of the SAMBA Development Team since 1998. He is currently working on a guide to LDAP for system administrators with O'Reilly Publishing. He holds a master's degree in computer science from Auburn University where he was also previously employed as a network and systems administrator. Gerald has published articles with various web-based magazines such as Linuxworld, and has authored instructional course for companies such as Linuxcare. In addition to this, he



acted as the lead author of “Teach Yourself Samba in 24 Hours” by Sam's Publishing.

### Who should attend:

System administrators who are responsible for heterogeneous Windows NT- and UNIX-based systems. Attendees should have user-level knowledge of both UNIX and Windows NT, and it is recommended they have systems administration experience in at least one of these OSes.

### Abstract:

Today's organizations choose computing solutions from a variety of vendors. Often, integrating the solutions into a seamless, manageable enterprise is an afterthought, left up to system administrators. This course covers specific problem areas in administering a mixture of UNIX and Windows NT systems. The focus will be on practical solutions that can be applied today to real-world administration problems.

### Topics include:

Overview of NT and UNIX Basic homogeneous setups  
Services: what's offered, and how similarities differentiate potential sticking points.

### Areas of interest:

- Electronic mail
- Web servers
- User authentication
- File serving
- Printing
- Faxes and modems
- Host-to-host connectivity
- Remote administration
- Backup and restore

### For each of the areas of interest we will cover:

- Current uses in homogeneous environments
- Available answers – where integration can happen
- Integration solutions, how to choose one, some useful tools
- Security considerations

## M3 LDAP – Past, Present and Future

*Instructor: Roland Hedberg, Catalogix*

Roland Hedberg has been working on and off with directory services since 1988, at the start with X.500 but over the years more and more with LDAP. Since 1993 he has been actively involved in the IETF standardization work around directory services and is the author/co-author of a number of RFCs in that area. He has also written a number of applications based on LDAP, been heavily involved in the SUNET email directory, in the TISDAG project and has contributed to the soon to be published Swedish LDAPv3 implementation. Presently he is running his own company and is working with integrating large distributed information systems.



### **Who should attend:**

Systems administrators who want to learn about LDAP, how it works and what good it can do for them. This will be an intense, fast-paced, full-day tutorial intended for people with little or no experience with LDAP.

### **Topics include:**

After introducing a bit of the philosophy and history underlying LDAP, this tutorial covers:

- The basic concepts of LDAP: Datamodel, protocol operations
- Demonstration of the two available public domain implementations
- Practical examples of usage
- Ongoing work with LDAP within the IETF

## M4 Secure Networking – An Introduction to VPN Architecture & Implementation

*Instructor: Tina Bird, Counterpane Internet Security*

Tina Bird is a network security architect at Counterpane Internet Security, which provides a Managed Security Monitoring Service. She has implemented and managed a variety of wide-area-network security technologies, such

as firewalls, VPN packages and authentication systems built and supported Internet-based remote access systems and developed, implemented and enforced corporate IS security policies in a variety of environments.

Tina Bird is the moderator of the Virtual Private Networks mailing list, and the owner of “VPN Resources on the World Wide Web”, a highly regarded vendor neutral source of information about VPN technology ([kubarb.phsx.ukans.edu/~tbird/vpn.html](http://kubarb.phsx.ukans.edu/~tbird/vpn.html)). Tina has BS in physics from Notre Dame and an MS and Ph.D. in astrophysics from the University of Minnesota.

### **Who should attend:**

System administrators and network managers responsible for remote access and wide area networks within their organization. Participants should be familiar with TCP/IP networking and fundamental network security, although some review is provided. The purpose of this intro tutorial is to provide a step-by-step guide to evaluating an organization's VPN requirements, selecting the appropriate VPN architecture, and implementing it within a pre-existing security infrastructure.

Virtual private networking technology provides a flexible mechanism for addressing connectivity needs within many organizations. This class focuses on assessing business and technical requirements for remote access and extranet connections; evaluating VPN technology; integrating VPNs within an existing network infrastructure; common implementation difficulties; and VPN security issues.

### **Topics include:**

- VPN security features (encryption, access control, NAT) and how they protect against common Internet threats
- Assessing your organization's needs for remote access
- IPSec, PPTP, application layer VPNs, and where they fit
- A brief review of commercial VPN products
- Implementing VPN technology within your organization's network
- Common VPN difficulties
- VPN security issues

After completing this course, students will be ready to evaluate their requirements for remote access and begin testing commercial VPN implementations.



## M5 Performance Tuning, Workload Analysis, and Capacity Planning Techniques

*Instructor: Adrian Cockcroft, Sun Microsystems*



Since presenting a tutorial at the first NordU conference Adrian has become a Sun Distinguished Engineer and now works for Sun's Integrated Products Group. He is researching the performance and manageability of extremely complex future system configurations. From 1995 to 1999 Adrian produced a monthly Performance Q&A column for Sunworld Online magazine and has given many tutorials, training classes, seminars and conference papers over the 12 years he has worked for Sun. Adrian is the co-author of three books: "Sun Performance and Tuning", "The Sun Blueprint on Resource Management", and "The Sun Blueprint on Capacity Planning for Internet Services". His tutorial will cover material drawn from all three books, and will also allow plenty of time for audience interaction, so bring your own questions!

### **Who should attend:**

This tutorial is targeted at System Administrators, Systems Engineers, Capacity Planners and Developers. All of Adrian's experience and examples are based on the Sun SPARC and Solaris platform, but many of the techniques are applicable to other versions of UNIX. Adrian has presented several tutorials to UNIX users converting from a Mainframe background and he can answer their usual questions like "where do I get performance metrics from and what do they mean".

### **Topics include:**

Performance tuning tools and techniques, updated since the book was published to cover Solaris 7 and 8, the latest UltraSPARC III based systems and the latest releases of performance tools.

Server consolidation, resource management and techniques for advanced process and workload based performance measurement and analysis.

Capacity planning techniques that can be used in high growth and high rate of change environments where there is no time to do complex in-depth performance modeling. The alternative to driving blind in these Internet

driven environments is presented as a set of simple guidelines, example processes and spreadsheet based models that can be implemented very quickly.

## M6-1 09.<sup>00</sup>-12.<sup>30</sup>

## Microsoft Active Directory an Island unto Itself?

*Instructor: Rolf Åberg, Senior Consultant, Duplex Datautbildning AB and Simplex System*



Rolf Åberg has been System Support Manager at Microsoft Swedish subsidiary and an applications developer before joining Microsoft. His view on Visual Basic is: "The only computer game I need." Another area of interest is SQL Server and he also has extensive experience in administering live networks. Holding an M.Sc. degree, Rolf has been training and consulting, as independent, on Windows 2000, Windows NT, Visual Basic and SQL Server since well into last century. As a writer his latest book is called "Allt om Windows NT Server" (All About Windows NT Server), which on almost 1400 pages attempts at living up to its bold name. In the (slow) works is another book by the tentative name of "Vägen till Windows 2000 och Active Directory" (The Road to Windows 2000 And Active Directory).

### **Abstract:**

Active Directory is Microsoft's first attempt at a directory service, i.e. something akin to Novell's NDS, Banyan StreetTalk or even NIS/NIS+. This half-day tutorial will equip the attendant with all necessary vocabulary such as Domain Forests, Kerberos Trusts and Multi-Master Replication. The tutorial will start by presenting the problems in the Directory Service in Windows NT and how Active Directory purports to solve these problems. Also, we will discuss what new problems Active Directory introduces, such as the root domain that has to be carved in stone and the inability to join two existing domains with the new Kerberos trusts.

In contrast to Novell's NDS Microsoft has chosen to keep the domain as the main replication boundary in Active Directory and also to increase the number of types of group in Active Directory, up to five. The role of the new Super Administration Group, Enterprise Admins will also be discussed. Active Directory has excellent features for delegating administration, every object (user account,



group, etc.) and every attribute belonging to the objects is protected by an Access Control List, ACL. There are wizards in Active Directory to help in setting up delegation, but it is also possible to change the ACL on one attribute to allow one user account to change only one attribute for one other user account. Without DNS support Active Directory cannot function. The only mandatory feature of the DNS servers are that they can handle SRV records (RFC 2782, which replaces RFC 2052). Thus there are several DNS servers that can play this vital part for Active Directory: the DNS Server in Windows NT, DNS Server in Windows 2000 and BIND 8.x. Kerberos is the primary logon authentication protocol used in Active Directory domains whenever two Windows 2000 computers communicate. As an, hopefully, interesting part we will demonstrate the use of Active Directory on Windows 2000 Server as a Kerberos logon server (Kerberos KDC) for UNIX and also how to use UNIX Kerberos to validate logons from Windows 2000.

#### Topics include:

- Problems in Window NT "Directory Service" that Microsoft wanted to solve with Active Directory
- Overview of Active Directory: Domain, Domain tree, Domain forest, Kerberos trusts, Schema
- Particulars of Active Directory - Interesting design decisions made by Microsoft
- Use of Organizational Units, OUs, in Active Directory and delegation of administration, Access Control Lists, ACLs in Active Directory
- DNS and Active Directory: Active Directory must have DNS support
- Kerberos in Windows 2000: Used only when two Windows 2000 computers communicate, or?
- Active Directory Domains: the most secure Windows environment

**M6-2** 13.<sup>30</sup>–17.<sup>00</sup>

## System Software that Exploits SAN Capabilities

*Instructor: Paul Massiglia, Veritas Software Corporation*

Paul Massiglia has been in the storage industry for over 20 years. He has held engineering and marketing positions with major storage suppliers, includ-



ing, Digital, Adaptec and Quantum. He is currently employed with VERITAS Software Corporation, where he acts as the company's representative to storage industry associations, including the SNIA. He also writes and presents technology white papers on subjects of importance to VERITAS, and is a frequent participant in industry conferences.

Paul Massiglia is former Vice-Chairman of the RAID Advisory Board and author of "The RAIDbook", "The Digital Large System Mass Storage Handbook", and "Managing Online Volumes in Windows Operating Systems".

#### Abstract:

The tutorial will begin with a discussion of host-based volume management, the challenges involved in making volume managers "cluster aware", and how the VERITAS SANpoint Volume Manager overcomes these challenges. The second segment of the seminar will focus on similar issues at the file system level. The semantics of UNIX file systems and how to implement those semantics in a multi-host environment will be discussed. The final segment will cover clustering. The VERITAS cluster server application model, and the cluster capabilities it enables will be reviewed. Cluster capabilities enabled by SANs will be discussed, as well as challenges introduced by SANs (e.g., zoning). VERITAS cluster server solutions to these problems will be reviewed. The SANpoint Control SAN management tool will be discussed in the context of enabling SAN functionality for clusters. The seminar will wrap up with a brief look at global computing using the VERITAS Global Cluster Manager.

This tutorial will discuss the VERITAS software products that build on SAN hardware capabilities to make robust, scalable enterprise computing environments. The basic premise of storage area networks is the connection of large numbers of storage devices to large numbers of servers. To beneficially exploit this connectivity, however, environmental software is required. Volume managers, which increase the availability and scalability of both disk drives and RAID subsystems must be made mutually aware, so that volume managers running in multiple SAN-attached servers can coordinate access to a pool of storage. Similarly, file system instances running in different servers must be aware of each other so that file systems can be shared. For application availability and scaling, clustering is required. VERITAS has spent the last 18 months enhancing both its foundation volume manager and file system products and its cluster manager to fully exploit SAN capabilities.

# Tutorials Tuesday, February 13, 09.<sup>00</sup>–17.<sup>00</sup>

## MTW1 Three days tutorial, part 2

### Tu2 Sendmail Configuration and Operation – Updated for Sendmail 8.11

*Instructor: Eric Allman, Sendmail, Inc.*

Eric Allman is the original author of Sendmail. He was the chief programmer on the INGRES database management project and an early contributor to the UNIX effort at Berkeley, authoring syslog, tset, the -me troff macros, and trek. He designed database user and application interfaces at Britton Lee (later Sharebase), and contributed to the Ring Array Processor project for neural-network-based speech recognition at the International Computer Science Institute. He is a former member of the Board of Directors of the USENIX Association.



#### Who should attend:

Systems 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 will be an intense, fast-paced, full-day tutorial intended for people who have already been exposed to Sendmail.

#### Abstract:

After introducing a bit of the philosophy and history underlying Sendmail, this tutorial covers:

- 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 the Domain Name System

### Tu3 Advanced Topics in Perl Programming

*Instructor:*

*Daniel V. Klein, Consultant*



Daniel V. Klein has been teaching a wide variety of UNIX-related subjects since 1984, has been involved with UNIX since 1976 and with Perl since 1995. His experience covers a broad range of disciplines, most recently involving dozens of high-performance websites, but also includes the Internals of almost every UNIX kernel released in the past 24 years, real-time process control, compilers and interpreters, medical diagnostic systems, system security and administration, web-related systems and servers, graphical user interface management systems, and a racetrack betting system. He contributes regularly to the proceedings of the USENIX Association, and is also their tutorial coordinator. He holds a Masters of Applied Mathematics from Carnegie-Mellon University in Pittsburgh, and in his free time is a member of an a capella choir and an improvisational comedy troupe.

#### Who should attend:

Experienced Perl programmers interested in honing their existing Perl skills for quick prototyping, system utilities, software tools, system management tasks, database access, and world wide web programming. Students should have used Perl for basic scripting for several months prior to taking this course.

#### Topics include:

- Complex data structures
- References and referents
- Memory management and garbage collection
- Anonymous data structures
- Building and using packages and modules
- Namespaces, scoping, and extent
- Global, local, and lexical variables
- Classes and objects
- Object-oriented programming
- Protected regions with eval
- Signals and exceptions

- Assorted tips and tricks to use Perl programming effectively

Upon completion of this course, students will be able to develop standard and OO-modules for code reuse and will understand complex and hierarchical data structures. Numerous code examples will be presented as a means of demonstrating advanced features of the Perl language.

## Tu4 Apache – Advanced

*Instructor: Simon Kenyon, Irial Ltd*



With his partner, Jan Säll, Simon founded Irial Ltd two years ago. During the last two year he has been consulting to, and doing development for, a number of clients in Ireland, the UK and Sweden. Prior to founding Irial Ltd, he was a consultant for ICL for over 11 years, working on a wide variety of projects.

He spent the last few years at ICL promoting the use of the Internet and Java and was head of the ICL Java Center of Excellence. He is a Sun Certified Java Programmer. For many years he was on the Executive Board of EurOpen, the European Forum for Open Systems, with responsibility for network services. He was the Chairman of EUnet, the European UNIX network. EUnet was the first commercial Internet provider in Europe. As such he was instrumental at getting EUnet recognized as a major player in the networks business by such people as NSF, DOE, DARPA, NASA, RARE and Cosine.

He was a founder member of the UK UNIX Users Group in 1983/4 and he is a member of the Irish Java Users Group and the Irish Internet Association. He has written numerous papers, articles and book reviews in the press, and has made presentations at a number of conferences.

### **Abstract:**

There is more Apache web servers on the Internet than all the other brands put together. This is because Apache is so easy to install and configure! Well, that's sort of true. It is quite straight forward to compile Apache and using the supplied configuration files get it to do something. What takes a little more time is getting Apache configured the way "you" want it. Therefore, this tutorial will focus on the things that "I" found hard to set up in Apache.

### **Topics include:**

- Virtual Servers: the setting up of Apache to serve more than one domain. We will cover both "name based" and "IP based" virtual hosts

- Redirection: the transformation of one URL into another. We will learn how to write rules for the rewriting engine
- SSL: Secure Socket Layer or the protocol underlying HTTPS. We will learn how to obtain a certificate and how to configure Apache to use this certificate
- Servlets: The server side equivalent of applets. They are like cgi scripts written in Java. We will learn how to configure Apache to support servlets using the jserv module

## Tu5 PHP: Scripting the Web

*Instructor: Rasmus Lerdorf, Linuxcare Inc.*



Rasmus Lerdorf has been designing large-scale UNIX-based solutions since 1989. In the Open Source community, he is known mostly as the creator of the PHP scripting language. He also sits on the Board of Directors of the Apache Software Foundation, is a member of the Apache-core team, and has contributed to a number of Apache-related projects. Prior to joining Linuxcare Inc., Rasmus was at IBM in Raleigh and before that, Bell Global Solutions in Toronto.

### **Abstract:**

PHP is a scripting language specifically designed for creating server-side web applications. In this tutorial Rasmus will talk briefly about how the language came to be and his motivation behind creating it. He will then move onto a whirlwind tour of the features of PHP followed by some real world examples and useful tips for creating powerful database-driven dynamic web sites with PHP.

# Wednesday, February 14, 09.<sup>00</sup>–17.<sup>00</sup>

## MTW1 Three days tutorial, part 3

## W2 DNS, its Extensions and BIND

**Instructor:** *Lars-Johan Liman, Netnod*

Lars-Johan Liman, M.Sc., employed at the Network Operations Center at the Royal Institute of Technology in Stockholm, Sweden, has played in the DNS arena for 10 years, starting out with local LAN administration, gradually moving on to top level domain and root server administration. He is, since 1994, responsible for the root name server in Stockholm, he is a member of ICANN's Root Server System Advisory Committee, and he is the chairman of the DNS Operations working group in the IETF. He's taught commercial, academic, and military courses on the subject of DNS since 1993.



### **Who should attend:**

Name-server administrators who need a deeper understanding of the DNS protocol and its recent extensions. Participants should already be quite familiar with the operation of DNS service, be familiar with Internet protocols such as TCP and UDP, and have knowledge of the basic theories of public- and private-key encryption.

### **Abstract:**

This tutorial will do a walk-through of the DNS protocol and explain the various bits and pieces from a standpoint of "general DNS knowledge". Special attention will be paid to recent extensions like Notify, Dynamic Updates, EDNS, DNSSEC etc. New features of BIND9 will also be mentioned.

## W3 Advanced CGI Techniques

**Instructor:**

*Daniel V. Klein, Consultant  
(see Tu3)*



### **Who should attend:**

Experienced Perl programmers and webmasters interested in learning more about CGI techniques than would be learned in a class on "how to write a CGI program in Perl". Attendees are assumed to know the fundamentals of HTML and CGI programming, as well in using (but not writing) Perl modules.

### **Abstract:**

CGI programming is fundamentally an easy thing. The Common Gateway Interface merely defines that a CGI program be able to read stdin and environment variables, and to write to stderr. But writing efficient CGI programs of any degree of complexity is a difficult process. In this class, we will examine the following CGI-related topics in Perl:

### **Multi-stage forms**

- Sequential "shopping cart" systems
- Undirected "jump page" systems
- Techniques for recording selections across pages

### **Cookies**

- For authentication and authorization
- For user tracking
- For data validation
- For data hiding and indirection

### **Data exchange and efficiency**

- File uploading
- Redirection and temporary aliasing

### **CGI Security**

- Taint checking
- Denial of service attacks
- Data security

### **Daemonization of processes**

- Fast CGI and mod\_perl
- Front-end/back-end solutions
- Backgrounding



### Invocation and response techniques

- Statelessness and statefulness
- PATH\_INFO vs. Cookies vs. CGI parameters
- Static vs. dynamic vs. locally cached responses

### Web automation from CGI scripts

- Fetching remote pages
- Parsing HTML and extracting data
- Determining and setting image sizes

In all examples, we will show which Perl modules exist to make these tasks easier. Numerous code examples will be provided, as well as pointers to web pages containing fully functioning examples for later examination.

## W4 Configuring and Administering Samba Servers

*Instructor: Gerald Carter,  
VA Linux Systems  
(see M2)*



### Who should attend:

This tutorial is intended for systems and network administrators who wish to integrate Samba running on a UNIX-based machine with Microsoft Windows' clients. No familiarity with Windows networking concepts will be assumed.

### Abstract:

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

This tutorial will use real world examples taken from daily administrative tasks in order to help you.

### Topics include:

- Install Samba from the ground up
- Understand the basic Microsoft networking protocols and concepts such as NetBIOS, CIFS, and Windows NT Domains including Windows 2000
- Configure a UNIX box to provide remote access to local files and printers from Microsoft Windows clients

- Utilize client tools to access files on Windows servers from a UNIX host
- Configure Samba as a member of a Windows NT Domain in order to utilize the domain's PDC for user authentication
- Use Samba as a Domain Controller
- Configure Samba to participate in network browsing
- Automate the daily tasks of managing Samba

## W5 Network Security profiles: A Small Collection (Hodgepodge) of what Stuff Hackers know about you

*Instructor: Brad C.  
Johnson, Vice President of  
Consulting –  
SystemExperts  
Corporation*



### Who should attend:

Network, system, and firewall administrators; security auditors or those that are audited; people involved with responding to intrusions or responsible for network-based applications or systems, which might be targets for hackers. 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 languages.

### Abstract:

This course will be useful for anyone with any type of TCP/IP-based system, whether it is a UNIX, Windows, NT, or mainframe operating system or a router, firewall, or gateway network host. Whether network-based host intrusions come from the Internet, an Extranet, or an Intranet, they typically follow a common methodology: reconnaissance, vulnerability research and exploitation. This tutorial will review the tools and techniques hackers (determined intruders) use to perform these activities. You will learn what types of protocols and tools to be aware of and you will become familiar with a number of current methods and exploits. The course will focus on how you can generate vulnerability profiles of your own systems. Additionally, it will review some of the important management policy and issues that are related to these network based probes.

The course will focus primarily on tools that exploit many of the common TCP/IP based protocols (such as WWW, SSL, DNS and SNMP) which underlie virtually all of the Internet applications, including Web technologies, network management and remote filesystems. Some 6 topics will be addressed at a detailed technical level. This course will concentrate on examples drawn from public domain tools because these tools are widely available and commonly used by hackers (and are available for you to use for free!).

**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, on-line research, TCP/IP protocol “mis”uses, denial of service, and hacking clubs. Important intrusion areas: discovery techniques, SSL, SNMP, WWW, DNS Tools: Including scotty, strobe, netcat, SATAN, SAINT/SARA, ISS, mscan, sscan, queso, curl and Nmap. Management issues: defining policies and requirements to minimize intrusion risk.

# NordU2001



# Conference Technical Sessions

## Thursday, February 15, Session 1

08.30-10.00



### Keynote in Plenum

#### What About the System Administrators?

*Speaker: Dr Rob Kolstad*

*Rob Kolstad has just completed a two year stint with the SANS Institute, an educational foundation specializing in system administration, networking and security.*

*Rob was with Berkeley Software Design, Inc. from 1992 to 1998, serving as its president for several years. BSDI engineers and markets a complete UNIX-compatible operating system for IBM PCs and clones. He teaches system administration in a wide variety of venues in addition to editing the USENIX Association's newsletter, ;login:.*

*Rob served six years on the USENIX board of directors and was instrumental in establishing the popular USENIX Large Installation System Administration (LISA) Conferences. He has chaired several conferences and continues to contribute to workshops and other gatherings.*

Just what is it those system administrators do? Backups? Password management? Help desks? Are they professionals? Or just rabid technicians hungry for power?

This talk will discuss the realm of system administrators, the distribution of tasks that administrators perform and the technical development and knowledge-base milieu of sysadmins.

### Theme: Operating Systems

10.20-11.05

### Th1 The Linux/IA64 project

*Speaker: Stephane Eranian, Hewlett-Packard Laboratories Palo Alto CA*

The IA-64 architecture, co-developed by HP and Intel, and its first implementation, the Itanium (tm) processor is going to reach market sometime in 2001. For the last two years HP Labs and other major companies have been working to port the Linux operating system to this new 64-bit architecture. The full source code produced by the project was contributed back to the Open Source Community in February 2000 when most of the specifications became public.

In this presentation, we first describe the key architectural features of IA-64. Then, we give a short history of the project: how it started, who is involved and where it is now.

The next section covers the kernel internals. We describe some of the key subsystems including virtual memory, system calls, process state and IA-32 emulation.

Finally, we give an update on the user level status for compilers, C library, math libraries, X11, Java as well as standard Linux distributions. We also describe the IA-64 Linux Developer's Kit which allows Linux/IA64 developments on a regular Linux/x86.

11.05–11.50



## Th2 NFS Version 4 Revealed

*Speakers: Brian Pawlowski, Network Appliance Inc. and Spencer Shepler, Sun Microsystems*

*Brian Pawlowski is Chief Technical Officer at Network Appliance Inc., where he works on scalable storage architectures. He is co-chair of the IETF working group tasked with the design of the next version of NFS. He has recently been studying the problem of utilizing Gigabit Ethernet bandwidth with distributed file systems. Before joining Network Appliance, Brian was at Sun Microsystems, Inc. where he worked on distributed file systems. He was one of the principal engineers involved with the definition of NFS Version 3. He also worked on file server performance in symmetrical multiprocessing architectures.*



*Spencer Shepler, who has worked for Sun Microsystems since 1998, is the editor and co-author of the NFS version 4 protocol. Spencer has been in the NFS industry for 11 years. First with IBM and then with Sun. Spencer has also been involved with the development and release of both versions of the SPEC NFS benchmark. Spencer's current responsibilities are leading Sun's NFS version 4 development team along with involvement in the IETF NFS version 4 Working Group.*

The Network File System (NFS) Version 4, is a new distributed file system similar to previous versions of NFS in its straightforward design, simplified error recovery, and independence of transport protocols and operating systems for file access in a heterogeneous network. Unlike earlier versions of NFS, the new protocol integrates file locking, strong security, operation coalescing, and delegation capabilities to enhance client performance for narrow data sharing applications on high-bandwidth networks. Locking and delegation make NFS stateful, but simplicity of design is retained through well-defined recovery semantics in the face of client and server failures and network partitions. This talk will reveal all.

Theme: Free UNIX/Open Source

13.00–13.45



## Th3 Too little, too slow; Memory Management in Practice

*Speaker: Rik van Riel, Conectiva S.A.*

*Rik van Riel first installed Linux in 1999 (with lots of help from friends). Despite his late start, with Slackware 2.x and kernel 1.1.59, he has managed to catch up enough to be an active contributor to various Linux projects.*

*Besides being a kernel hacker, he helped along a few documentation projects, he co-founded NL.linux.org and is one of the hosts of the #kernelnewbies IRC channel on irc.openprojects.net.*

*Thanks to Conectiva S.A., a big Linux company from Latin America, he is now able to practice his hobby full time. Currently his main activities are hacking the VM subsystem, maintaining the fair scheduler and assisting other kernel hackers on #kernelnewbies.*

This lecture will start with a (short) introduction to memory management. A quick overview of the problems that virtual memory management faces, and some tactics to cope with them will be presented.



After that we will take a look at the past and present of the memory management subsystem in the Linux kernel. We will see how Linux VM works and why it does not work very well in some cases.

The lecture will conclude by analyzing the strong and weak points of both the thing presented in the VM introduction and older Linux VM code. This leads to the design for the new VM, which is currently being written by Rik and others.

13.45–14.30

#### Th4 Fast routing in Linux

*Speakers: Jamal Hadi Salim, Nortel Networks and Robert Olsson, SLU*

*Jamal Hadi Salim has been working at Nortel Networks for over six years in a variety of areas ranging from Digital Signal Processing to SS7. He has been contributing to Linux since 1994.*

*Robert Olsson is deeply involved in the Bifrost project, which distribute a small Linux flashdisk-distribution for routing/firewalling/IP-login, which has a lot of user, but are still quite anonymous.*

The availability of cheap, powerful commodity hardware makes it more viable to build routers based on Linux. Given the Open source nature of Linux, One can deploy a lot more features on Linux in a shorter time than on a commercially based one. In fact, Linux has already got a lot more features than a lot of expensive commercial routers.

We attempt to enhance Linux' capacity for routing. Initial attempts indicate a doubling of routing performance over vanilla Linux on a single processor x86 PC. In this presentation we reveal some of the techniques used to scale Linux.

Commodity hardware with a well-tuned operating system can today deal with current Internet loads in many installations and it provides an extremely flexible platform for routing.

Routing and network capabilities of commodity hardware combined with new software techniques is now becoming an emerging area of research.

15.00–15.40



#### Th5 FreeBSD – The Hidden Power behind the Internet

*Speaker: Poul-Henning Kamp*

*Poul-Henning Kamp believes that UNIX is the best OS ever made so far, he is convinced we can still make it better and he has been trying to do so since the early eighties.*

*Ever since Minix 1.0 came out, Poul-Henning has been running UNIX on his laptop, and via 386BSD he came to FreeBSD. In FreeBSD he has been release engineer for a number of FreeBSD releases, written, rewritten and cleaned up many pieces of FreeBSD kernel, written a memory allocator, a password scrambler, the beerware license and generally been having a good time doing so.*

*Poul-Henning lives in Denmark with his son, his daughter, about ten FreeBSD computers and a couple of the world's most precise NTP clocks. He makes a living as an independent contractor doing all sorts of magic with computers and networks.*

Which operating system is the power behind major Internet sites like The Internet Movie Database and Yahoo? Which OS is inside the big routers from Juniper and Ericsson? Which OS is used in embedded products by the likes of Nokia and IBM? What does Slashdot put up as a firewall when they are under attack? The answer to all these questions is "FreeBSD". FreeBSD is closing in on release 5.0, which will contain significant new features and improvements.

This talk will present the latest news from the FreeBSD project.

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## 15.40–16.20

### Th6 Linux High Speed Networking

*Speaker: Jes Sørensen, Linuxcare Inc.*

*Jes Sørensen has been working on the Linux kernel for more than six years, the last three as the maintainer of Linux/m68k. He used to work at the European Laboratory for Particle Physics ([www.cern.ch/](http://www.cern.ch/)) where he worked on very high performance networking, Linux clusters and Linux/IA64. This has included writing Linux device drivers for Gigabit Ethernet and HIPPI (High Performance Parallel Interface, an 800Mbit/sec supercomputer network). Jes now works for Linuxcare Inc. in Canada ([www.linuxcare.com](http://www.linuxcare.com)) where he continues to work on Linux/IA64, high-speed networking and other low level Linux issues.*

Linux is moving into the world of supercomputing and has started to take over jobs previously reserved for supercomputers and high end workstations from companies such as SGI, CRAY, DEC and IBM. On top of this, gigabit class network equipment, in particular Gigabit Ethernet, has become a commodity item. This makes it feasible to integrate Linux systems into existing super computer network facilities and create new Linux based gigabit class networks such as in clusters and for servers. Recent developments such as the Tux web content accelerator, which holds the current specweb99 record shows that Linux is to be taken serious in the world of future networking.

This talk will discuss the history of Linux high speed networking and the author's work on Linux drivers for HIPPI (High Performance Parallel Interface) and Gigabit Ethernet as well as general issues on how to optimize and tune applications to benefit from high performance networks. It will continue with a look at the next generation of high performance network improvements features in Linux such as zero copy networking.

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## 16.20–17.00

### Th7 GNOME Technologies in Real-World Applications

*Speaker: Frederico Mena-Quintero, Helix Code Inc.*

*Frederico Mena-Quintero is one of the co-founders of the GNOME project. He is employed by Helix Code Inc., where he is the coordinator of the calendar components in the Evolution groupware suite. Frederico is also the maintainer of several other packages and documents in GNOME and was*

*the maintainer of the GNU Image Manipulation Program (GIMP) before he started with GNOME.*

One of the goals of the GNOME project is to address the lack of certain modern technologies in free systems. We have created a number of libraries that make it easier to write large-scale applications. This presentation will show how the Evolution groupware suite uses the following features in GNOME: the Bonobo component model, the GNOME canvas display engine, the gnome-print libraries, the GtkHTML component, the Camel mail-handling library, and how all of this is integrated together to create a good experience for the user.

## Thursday, February 15, Session 2

**Theme: Storage Area Network, SAN** (see also Th17)

**10.20–11.05**

### **Th8 Solving the Problem of Distributed Resource Management**

*Speaker: Mikael Holmqvist, Sun Microsystems AB*

Jiro technology brings the benefits of industry-defined standards and intelligent network connectivity to storage management. Jiro technology offers a proven environment for developing management software that can be deployed in diverse, distributed networks, regardless of underlying operating systems or hardware.

For developers, this translates into faster design cycles, lower development costs and more opportunity to focus on adding valuable functionality to management applications.

For enterprise IT managers, using applications and storage resources enabled with Jiro technology will result in improved resource management and utilization, lower costs, and greater control over critical information systems.

**11.05–11.50**



### **Th9 Business without Interruption with SAN and Clustering Solutions**

*Speaker: Erik Möller, VERITAS Software AB*

*Erik Möller is Product Marketing Manager in the Nordic Countries. Erik Möller has earlier been working as a product specialist at VERITAS Software AB. He has been working with support and installation of company critical systems in five years.*

In today's economy, information is the fuel that drives business. Ensuring high availability for applications and data is critical for success. What is required to meet the demands of 24x7 availability, 99,999% uptime and an information

flow that doubles every year? In this seminar, we will describe how to build and deploy HA and SAN solutions to meet these demands. We will also take a close look at the clustering technology, describe how it works and the requirements on other parts of the system. We will discuss a “layered” approach to managing availability and quality of service within data centers – providing you with a model for attaining the levels of availability or performance your business operations require, even in rapidly growing, changing environments.

## Theme: Refereed Papers

13.00–13.35

### **Th10 Building High-Availability Webhosting Solutions using the GNU/Linux Operating System and Commodity Hardware**

*Authors: Kenneth Geissshirt, Per Gøterup, and Jacob Thomsen, Netgroup A/S*

Hardware is getting faster and cheaper all the time which makes it more attractive to build supercomputers and high-availability solutions using commodity hardware instead of buying expensive solutions from classic UNIX vendors.

By building a GNU/Linux based cluster we wished to achieve three goals:

- i) High-availability
- ii) Scalability
- iii) Cost-effective

We will in our presentation discuss the architecture, the implementation and daily administration of a high-availability cluster based on the GNU/Linux operating system and commodity hardware. Moreover, we will report performance measurements and we will outline our procedures for upgrading system software including the kernel.

Our experiences with commodity hardware cluster, Linux and free software are gathered from our webhosting facility located in Copenhagen, Denmark. We have migrated from SGI Origin 200 servers with an external RAID system to a cluster of large personal computers without any special hardware or software. The cluster has currently 12 nodes, and each node in the cluster consists of an Athlon processor running at 800 MHz, 768 MB memory and 300 GB disk space.

Netgroup A/S hosts more than 250 web sites containing more than 50 GB of data. The traffic is excess of 100 GB per day. A number of web sites are dynamically generated and they depend heavily on access to the relational database MySQL.



## Th11 Sniffing the Sniffers – Detecting Passive Protocol Analyzers

*Authors: Jon Baldock, EMEA Office Solutions Intel Corporation UK Ltd and Craig Duffy, Principal Lecturer, Bristol University, West of England*

Over the last decade the growth of e-commerce, along with the extensive use of the Internet and Intranets have pushed the security of computer networks to the forefront. This paper looks at a rather neglected but very important area: malicious passive protocol analysis, or sniffers as they are commonly called. The paper reviews the role of sniffers in network security breaches and examines the reasons they are so difficult to combat. The paper then goes on to outline a novel suite of tools based on various approaches to detecting, or at least limiting the search space for, protocol analyzers. The proposed suite of tools is compared with some currently available tools and improvements are suggested. Finally the paper reviews the outlook for defenses against the malicious use of protocol analysis, reviewing the various strategies that could be employed from hardware approaches, through changes in network topologies, to protocol encryption and authentication. The likely impact of IP Next Generation (IPng/IPv6) is discussed in detail. The paper concludes that more can be done to combat protocol analysis but appropriate pro-active network security will require a combination of a large number of different tools and techniques.

## Th12 Certificate Transformation and Authorization in Ad Hoc Networks

*Authors: Catharina Candolin, Janne Lundberg and Hannu H. Kari, Helsinki University of Technology*



An ad hoc network is a collection of nodes that do not need to relay on a predefined infrastructure to keep the network connected. The nodes may vary in size, battery power, mobility patterns, functionality etc. Although the basic assumption in ad hoc networking is that most nodes participate in network operations, there might still exist nodes that are not able to offer the network any functionality. For example, a sensor may very well perform its task of collecting data and transmitting it to a larger station, but to ask the sensor to participate in routing and network management as well as requiring information for its own usage might already be too much. We consider the ad hoc networks discussed in this paper to be administered by various organizations. When an organization wishes to use services of another organization, it might not be willing to reveal any information regarding its internal structure to the other organization. However, in order for the other organization to offer any services, it must be able to authorize the service requests.

The main focus of this paper is to discuss a model of authorization especially suited for mobile ad hoc network, which wishes to preserve the privacy of its internal structure. Our solution is based on SPKI certificates, certificate chains, and proxy agents performing certificate transformation and retrieving services. When a node in the ad hoc network requests a service, the proxy agent will use its own identity to retrieve the service on behalf of the node, thus hiding the requesting node from the service provider as well as the service origin from the requesting node. The certificate chain has, in a sense, been cut, and two virtual certificate chains have been created. Although

several solutions for establishing trust using certificates exist, we argue that solutions meets the needs of mobile ad hoc network better than existing solutions, since our model takes into consideration the fact that nodes may differ in capacity. Our model has the advantage of preserving privacy of the node internals to network while at the time hiding the origin of service from the nodes. Also the idea of using certificate transformation has not been considered in the previous solutions.

15.15–15.50



### Th13 Client Effects

*Author: Brian Pawlowski, Network Appliance Inc (see Th2)*

A user's perceived performance of a distributed file system is defined by a complex interplay of client platform, network architecture and choice of server. Within each domain, many variables can effect the achievable throughput for even a set of simple benchmarks. However, broad patterns emerge in the performance capacity of clients as a function of CPU and multiprocessing support.

This paper presents a survey of the performance of several client configurations and presents a normalized comparison based on the results of several benchmarks using the Network File System as a basis for comparison. A comparison of clients (Solaris, FreeBSD and Linux) provides a view of current state of the art.

The effects of latency on throughput are discussed with some examples. A model is proposed to interpret the limits of paralleling techniques like multithreading in increasing throughput. The focus is primarily on Gigabit Ethernet performance, though the limit of the use of slower network technologies is covered. Factors affecting performance are described with suggested areas for improvement mapped out. Pitfalls in tuning are touched on.

Finally, the implications of remote file access performance for today's clients are summarized in the light of emerging technologies like DAFS and NFS Version 4.

Subsequent sections:

- Client descriptions
- The benchmarks and tools
- Results
- Interpretation
- The effect of emerging technologies
- Summary

15.50–16.25

### Th14 NDMP (Network Data Management Protocol), Past, Present and Future

*Author: Harald Skardal, Network Appliance Inc*

*Harald Skardal is a Sr. Consulting Engineer with Network Appliance Inc. He is the technical editor for the next version of NDMP, version 4, and he is currently leading the work on the company's data management strategy.*

Brief history and current status; NDMP version 4: Where we are; Becoming an IETF standard. NDMP and NDMP extensibility: NDMP as a platform for data management: Accessing vendor specific functionality through NDMP.

## Th15 Applying Decentralized Trust Management to DNS Dynamic Updates

*Authors: Pasi Eronen, Helsinki University of Technology and Jonna Särs, Nixu Ltd*

DNS has long been a good example of the lack of security in the basic Internet infrastructure. It is a critical service, but was originally not designed to resist active attacks. The DNS security extensions were defined to combat the problems: they provide data integrity and authentication using digital signatures, and optional authentication of transactions (requests and replies).

Another new feature of DNS is the possibility to dynamically update DNS data (RFC 2136). This can be used to update DNS records of hosts with dynamic IP addresses, for example. DNS dynamic updates can be protected using the DNSSEC transaction signatures, or the TSIG mechanism.

It is important to notice that there are really two separate DNS use cases with different security requirements. Querying for data requires data authentication but not necessarily authentication of messages. Dynamic updates require transaction authentication and also authorization, i.e. a way to specify who is allowed to change what.

So far, there have not been any good proposals for expressing authorization in this context. Existing solutions usually use local configuration files, which are essentially a form of access control lists. We see several problems in this approach. For example, a name server is not necessarily operated by the same party which actually owns the zone (and should be responsible for deciding who can change it).

In this paper, we propose a solution for authorizing DNS dynamic updates, based on the decentralized trust management approach. Basically, trust management systems use a set of unified mechanisms for specifying both security policies and security credentials. The credentials are signed statements (certificates) about what principals are allowed to do.

We have modified the BIND 9 name server to use this approach. For trust management we use the KeyNote 2 library, also used e.g. in OpenBSD's ISAKMP implementation. Our solution supports the separation of DNS server administration and update authorization. KeyNote also allows specification of more flexible access restrictions than the use of ad hoc access control lists.

By applying state-of-the-art security mechanisms, we have created a more flexible and scalable solution than the existing approaches. We hope this allows more widespread use of DNS dynamic updates.

# Thursday, February 15, Session 3

**Theme: Software Development** (see also F5–F6)

**10.20–11.05**

## **Th16 EJB Enterprise Java Beans**

*Speaker: Simon Kenyon, Irial Ltd (see Tu4)*



Having just spent the last 9 months designing and implementing a large Internet Retail Bank using EJB technology, this presentation will be based on the practical application of EJB; when to use it and more importantly, when not to use it.

**Theme: Storage Area Network, SAN** (see also Th8–Th9)

**11.05–11.50**

## **Th17 SAN or NAS, a Holy War not Worth Fighting**

*Speaker: Björn Fridborn, Technical Account Manager, EMC*

Depending on what application you are using it might be a good fit for either SAN (Storage Area Networks) or NAS (Network Attached Storage). This paper briefly describes pro's and con's with the different solutions. By combining SAN and NAS in the same Storage infrastructure (Enterprise Storage Network) users will be able to reduce management cost and increase efficiency and productivity. With the new MPFS (Multi parallel File System) users are also able to share data between NAS and SAN.

**Theme: Sponsors Presentations**

**13.00–13.35**

## **Th18 DocBook for free Software Projects**

*Speaker: Nik Clayton, FreeBSD Documentation Project Manager, Marketing Manager BSDi EMEA*

Many free software projects have an associated documentation project, to try and ensure that users can find accurate and timely information. Various projects; plain text, GNU Info, HTML, POD, TeX and LaTeX have tried a variety of formats. This talk discusses the requirements of these projects, and introduces the DocBook markup language, the advantages it has over other formats, the toolchain used to produce different output formats for the end user, related applications, and caveats for implementers. DocBook has been adopted by the FreeBSD, Linux, KDE, GNOME, documentation projects, as well as being the internal format for companies like O'Reilly and Sun.



13.35–14.10



## Th19 Hitachi Data Networks: Information Infrastructure for the E-nterprise

*Speaker: Vincent Franceschini, Director of Data Networking Architecture, Hitachi Data Systems*

The new E-nterprise IT managers are facing today one of the most challenging situation: the deployment of enterprise-wide information infrastructures. The challenges to meet are to be able to scale rapidly without disrupting major business applications and capable to cope with the huge data volume growth noticeably expected in Internet business application environments. Building such infrastructures would require the help of specialized Storage Networking solution suppliers that have been able to develop complex architectures like Storage Area Networks. These information networks also require easy management tools without compromising the data protection and business application high-availability aspects. This presentation will give you an overview of Hitachi Data Systems directions for Data Networking solutions in business application environments.

14.10–14.45



## Th20 Linux Standard Base and Open Source Quality Control Based on LSB's Test Suits

*Speaker: Magnus Runesson, Cendio Systems*

*Magnus Runesson holds a MSc in Computer Science and Engineering from Linköping Institute of Technology, Sweden. He works for Cendio Systems as an Embedded Linux consultant, specializing in processes and methods for software engineering.*

Linux has been criticized for the risk that different distributions will become incompatible with each other. This criticism has lead to the creation of the Linux Standard Base (LSB). The goal of the LSB is to develop and promote a set of standards that will increase compatibility among Linux distributions and enable applications to run on any compliant Linux system. Most Linux distributions today aim at supporting the LSB. The LSB also includes test suits that can be used for quality control of a complete distribution.

The seminar will give an overview of what is included in the LSB and how to certify that a Linux distribution complies with the LSB. Further, the possibilities to use the LSB test suits to enable quality control of open source software will be discussed.

**15.15-15.50**

## **Th21 Compaq AlphaServer and Tru64 UNIX-Platform for the next Generation of Switches at Ericsson**

*Speaker: Jon Reveman, Technical Expert, Compaq Computer*

Compaq's investments in Alpha and Tru64 UNIX have recently resulted in visible successes. AlphaServers with Tru64 UNIX are used as supercomputer in atomic energy research as well as in exploration of the human genome. Ericsson has also selected the platform for future generations of AXE-switches.

Jon Reveman who is system architect will in this session describe how advanced real time systems are developed upon a standard UNIX/Risc platform.

There will also be a review of latest developments of Alpha and Tru64 UNIX.

Take the opportunity to learn more about Tru64 UNIX in our UNIXGAMES. Compete and win on [www.compaq.com/unixgames](http://www.compaq.com/unixgames)

**15.50-16.25**



## **Th22 SGI Modular Computing - IRIX and Linux for High Performance Computing**

*Speaker: Kristian Wedberg, SGI*

*Kristian Wedberg has been at SGI for 5+ years as a technical expert on servers and supercomputers.*

Technical description of:

- SGI Origin 3000 and NUMAflex, a revolutionary new server architecture
- MIPS R14000 and Intel Itanium for the SGI Origin 3000
- IRIX and Linux for High Performance Computing
- Cluster vs. Single System Image tradeoffs

**Note: The program for this track is preliminary and more sponsor speeches can be added later.**

# Friday, February 16, Session 1

Theme: Security

08.30–09.15



## **F1 Network Security Profiles: A Small Collection (Hodgepodge) of what Stuff Hackers know about you**

*Speaker: Brad C. Johnsson, Vice President of Consulting – SystemExperts Corporation*

This session will be useful for anyone with any type of TCP/IP-based system.

Whether network-based host intrusions come from Internet, an Extranet, or an Intranet, they typically follow a common methodology: reconnaissance, vulnerability research and exploitation. This session will review a few of the tools and techniques hackers (determined intruders) use to perform these activities.

The session will focus primarily on tools that exploit many of the common TCP/IP based protocols (such as TCP, WWW, SSL, DNS and SNMP) which underlie virtually all of the Internet applications. This course will concentrate on examples drawn from public domain tools because these tools are widely available and commonly used (and are available for you to use for free!).

09.15–10.00

## **F2 Kerberos: Principles and Use**

*Speaker: Assar Westerlund, SICS*

*Assar Westerlund is one of the main people behind Heimdal, the international Kerberos implementation.*

This talk will include how the Kerberos system works, how it is used today in Solaris, Windows 2000, and other systems, how it compares and interacts with other security systems, and some on the future of Kerberos.

10.20–11.05

## **F3 Virus – Only one Part of the Problem**

*Speaker: Staffan Olsén, Trend Micro*

*Staffan Olsén is working as Sales Engineer in the Nordic Region at Trend Micro. Main responsibilities is supporting resellers and distributors with presale and design.*

The content problem:

- What is a Trojan, Virus, Worm, Hacking tool, Hoax, Malware etc?
- More overall knowledge, more viruses – are there any known viruses for UNIX?
- What is in the wild and what is in the zoo?
- New equipment with Internet connection, Mobile phones, PDAs etc
- Threats in the future

- What areas do we need to protect and why?
- Multiple layer protection from desktop to gateway
  - Protect new devices by trap applets
  - What is the reason for multiple layers?

**11.05–11.50**

## **F4 Spam and the Spam Prevention**

**Panel discussion**

*Chairman: Eric Allman, Sendmail Inc*

**13.00–15.00**

## **Keynote in Plenum and Closing Ceremony**

*See page 30*

# **Friday, February 16, Session 2**

**Theme: Software Development** (see also Th16)

**08.30–09.15**

## **F5 Project Kylix (Delphi for Linux) and JBuilder – Native Rapid Application Development**

*Speaker: Göran Källmark, Inprise/Borland*



*Göran Källmark, 36, is a broadly experienced IT-Professional. In his over 14 years in the IT-Industry he has held numerous different positions varying from Technical Support, Consulting, Training, Product Management, Pre-Sales, Sales to Business Development and Strategic Account Management at many well known IT-Companies like Borland and Oracle. He is a frequent speaker at Events and has written several articles on Database technology and Object Oriented technology. In recent years he has been focused on business development and on building a network of partners supporting Inprise/Borland business in the Nordic Countries. He is currently working for Inprise/Borland European Head Quarter in Amsterdam. He lives in Sweden with his family.*

To produce the right business logic on time is no longer sufficient! The system should also have attributes like high availability, scalability, fault-tolerance, predictability and security. The systems should also be easy to develop, deploy, integrate and manage. How can we achieve this while reducing the risk? Borland presents CORBA and J2EE products in conjunction with the best of breed development tools.

09.15–10.00



## F6 Distributed Software Development

*Speaker: Matthias Kalle Dalheimer, Klarälvdalens Datakonsult AB*

*Matthias Kalle Dalheimer is the President & CEO of Klarälvdalens Datakonsult AB, a Swedish company developing multi-platform software, but also a founding member of the KDE project, where he is a core team developer. In both of these aspects of his professional life, he is working in distributed software development projects which gives him a lot of experience on this subject.*

In my talk, I will discuss many of the technical and social challenges that each distributed software development project faces, as well as show some of the solutions to these challenges. This includes traditional and well-known software tools such as CVS, lesser-known but still very useful software tools such as Code Co-op as well as hints how to integrate developers from different cultures with different native languages and how to enable them to work with as little friction as possible. Examples will be drawn both from the open source project KDE as well as from commercial projects my company is working on.

## Theme: Mobile Computing

10.20–11.05



## F7 TCP and UDP in the Mobile World, or what is wrong with Mobile IP version 6, and how to fix it

*Speaker: Pekka Nikander, Chief Scientist, Ericsson Research Nomadic Lab, Finland*

The TCP/IP protocol suite was originally designed in late 1970s, and finalized in 1981. Since then, its transport layer protocols, TCP and UDP, have been relatively stable. On the other hand, the environment where the protocols work, and the requirements placed upon them, have gradually but constantly changed. So far, it has been possible to cope with the situation by upgrading underlying protocol, i.e., IP, or by adding patches between the IP layer and the upper layers. The current Mobile IPv4 standard is a prime example of this kind of patching; it goes hoops over to create an illusion of a static environment to both TCP and UDP. In a way, this has been necessary in order to provide full backward support to the legacy applications and network infrastructure.

The advent of the next generation of IP, IP version 6, creates a possibility to change the situation. However, in my opinion this is not happening, at least not to the extent desired. The current Mobile IP version 6 (MIPv6) proposal is still trying to support the old semantics towards TCP and UDP, and, among other things, doing so greatly increases both protocol processing complexity and the average IP header size.

In this talk, I will analyze the assumptions behind the current Mobile IP version 4 and 6 design, and point out how some of the assumptions do not necessarily hold for version 6. After that, I will present a different mobility architecture for IPv6, and describe our early prototyping results.

**11.05–11.50**



## **F8 Ad hoc Networking with Bluetooth**

*Speaker: Catharina Candolin, Helsinki University of Technology*

*Catharina Candolin is a researcher at Helsinki University of Technology focusing on ad hoc networking and security.*

Bluetooth is a short-range wireless cable replacement technology enabling restricted types of ad hoc networks called piconets to be formed. A piconet adopts a master-slave architecture to keep the network connected, and several piconets may connect and form so called scatternets. One current trend in wireless networking is connecting small wearable devices, such as mobile phones, PDAs, and mp3-players, and allows them to communicate and share resources and services between each other. Bluetooth seems to be a suitable technology for personal networking, although issues such as security and internetworking seem to need a somewhat different approach.

**13.00–15.00**



## **Keynote in Plenum and Closing Ceremony**

### **How can Communication and Information Technology Contribute to my Life?**

*Speaker: Finn E. Olsen, Ericsson Denmark*

*Head of Business Development at Ericsson in Denmark and has since 1973 worked with information and communication technology – design of the X.21 datanetwork and Account Manager for Mobile Operators and international operators. After a period of four years as head of Product Management for Ericsson in Denmark, Finn was appointed head of Business Development responsible for identifying new business based on an understanding of the market, end-users, enterprises and society.*

- What is the end users opinion of today's technology?
- Is there a difference between a man and a woman?
- Are Early Adopters and Pragmatics/Conservatives different people?
- How do we communicate?
- How to offer true value to the human being?

## **BoFs** (see page 31)

If you want to give a one hour BoFs presentation on  
Monday, February 12, 17.00–21.00,  
Wednesday, February 14, 17.00–18.00, 20.00–21.00 or  
Thursday, February 15, 17.00–19.00  
please contact Lars Tunkrans at [bof@nordu.org](mailto:bof@nordu.org).



## Social Events

### Welcome Reception, Wednesday February 14, 18.00

The Welcome Reception will take place in the exhibition area at Norra Latin. The reception is included in the registration fee only if marked on your registration form.

Food and drinks are sponsored by  
Sun Microsystems AB



### Historical evening at Livrustkammaren (The Royal Armoury, The Royal Palace, Stockholm) Thursday February 15, 19.00

Welcome to a historical evening at Livrustkammaren (the Royal Armoury) at The Royal Palace, situated in the Old town. After a guided tour of the museum, you will be able to enjoy tapas, beer and a variety of entertainment in the beautifully built stone vaults of the museum. Do not miss the opportunity to experience the oldest museum in Sweden and at the same time have a nice time with friends and colleagues.

Price: SEK 550 (incl. VAT 25%)



*The Royal Palace, Stockholm*



*Last year's social event*

### BoFs

Three multiple BoFs (Birds-of-a-Feather sessions) are planned for NordU2001, see Program at a glance, page 4. A BoFs is basically an opportunity for the conference delegates to chair a discussion of their own choice. The program committee encourages any conference attendee wanting to chair a BoFs session to mail a short description of the BoFs subject to [bof@nordu2001.org](mailto:bof@nordu2001.org)

Scheduled BoFs will be displayed on the conference notice board.

### Commercial Exhibition

A commercial exhibition will be arranged in conjunction with the Conference. Please contact Congrex if you are interested in participating at the exhibition (see address inside back cover).

The exhibition will be open during the following hours:  
February 14–15, 09.00–17.00  
February 16, 09.00–15.00

# Registration Guidelines

## Registration on-line

Registration on-line <http://www.nordu.org/NordU2001/>

## Advance Registration

The enclosed registration form should be used when registering for the Conference, Social Programs, and for hotel reservations during the Conference. Confirmation will be sent upon receipt of payment. For payment details, please see below. Registration for events, which are included in the registration fee, must also be marked on the form, in order to obtain a ticket. Please note that registration to the various events will be confirmed upon payment on a "first come-first served" basis and number are limited.

The registration fee for delegates includes admission to the Conference and the Exhibition, daily tea/coffee, lunches and Welcome Reception.

Please carefully follow the instructions below for payment of all fees.

Swedish tax legislation requires participants to pay their registration fee either including or excluding Swedish VAT. Therefore, please identify your category below and choose the appropriate alternative on the registration form.

## Excluding VAT

- All registration fees paid from countries outside the European Union.
- Registration fees paid by companies and other taxable entities within the European Union.

## Including VAT

- Registration fees paid by non-taxable entities (institutions/organizations etc) and private persons within the European Union.
- All registration fees paid by participants or companies within Sweden.

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### Registration Fees excluding 25%VAT

Conference registration members \*)  
two day's fee  
Conference registration members \*)  
one day's fee  
Conference registration, non-  
members, two day's fee  
Conference registration, non-  
members, one day's fee  
Students, two day's fee  
Tutorial three day's fee  
Tutorial MTW1 (including book)  
Tutorial two day's fee  
Tutorial one day's fee  
Tutorial half day's fee

### Paid before January 14 2001

SEK 3,520  
  
SEK 2,720  
SEK 4,320  
  
SEK 3,520  
SEK 960  
SEK 7,040  
SEK 7,440  
SEK 5,760  
SEK 3,600  
SEK 1,800

### Paid after January 14 2001

SEK 4,320  
  
SEK 3,520  
SEK 5,120  
  
SEK 4,320  
SEK 1,760  
SEK 7,040  
SEK 7,440  
SEK 5,760  
SEK 3,600  
SEK 1,800

### Registration Fees including 25% VAT

Conference registration, members \*)  
two day's fee  
Conference registration, members \*)  
one day's fee  
Conference registration, non-  
members, two day's fee  
Conference registration non-  
members, one day's fee  
Students, two day's fee  
Tutorial three day's fee  
Tutorial MTW1 (including book)  
Tutorial two day's fee  
Tutorial one day's fee  
Tutorial half day's fee

### Paid before January 14 2001

SEK 4,400  
  
SEK 3,400  
SEK 5,400  
  
SEK 4,400  
SEK 1,200  
SEK 8,800  
SEK 9,300  
SEK 7,200  
SEK 4,500  
SEK 2,250

### Paid after January 14 2001

SEK 5,400  
  
SEK 4,400  
SEK 6,400  
  
SEK 5,400  
SEK 2,200  
SEK 8,800  
SEK 9,300  
SEK 7,200  
SEK 4,500  
SEK 2,250

\*) SSLUG-, EurOpen.SE-, USENIX-, DKUUG-, NUUG- and FUUG-members.

## Hotel Information

A number of hotel rooms in different price categories have been booked in Stockholm at preferential rates for the Conference.  
The prices below include VAT and breakfast.

	Single room/night	Double room/night	Deposit/room
Wallin Hotel	SEK 1,165	SEK 1,405	First night's payment
Rica City Hotel Kungsgatan	SEK 1,440	SEK 1,740	- " -

Hotel accommodation will be reserved when Congrex has received the registration form, together with the hotel deposit of the first nights payment. The deposit will be deducted from the hotel bill upon presentation of the participant's personal voucher, which will be issued upon registration in Stockholm. Hotel reservations should be made on the registration form. Congrex reserves the right to book another hotel category if the desired accommodation should be fully booked. After the deadline for hotel reservation, which is **January 14, 2001**, Congrex cannot guarantee a hotel room or the preferential rate.

### Payment

Payment should be made in advance by one of the following means:

- Banker's Draft, which should be sent together with the registration form by ordinary mail. The Banker's Draft should be purchased at your bank and made out in SEK to Congrex, Attn: NordU2001. Please cross the draft. We are not able to accept personal checks, company checks or Eurocheques.
- Transfer to SEB (Skandinaviska Enskilda Banken), SE-106 40 STOCKHOLM, Sweden, SWIFT-code: ESSESESS, account No. 5267-10 216 90, in SEK to Congrex,  
Attn. NordU2001, P.O. Box 56 19, SE-114 86 Stockholm, Sweden.  
Please do not forget to indicate the payment reference number 0116 and your name. Events and hotel reservations will be confirmed when Congrex has received payment.
- American Express, Visa or Eurocard/Mastercard may be used for all charges. Please indicate card number and expiry date on the registration form.
- Scandinavian residents may pay by bank or postal giro transfer. Bankgiro 224-7021, Postal giro 9052-2.

Please complete the enclosed registration form and send it along with your payment to:

Congrex Sweden AB  
Attn: NordU2001  
PO Box 5619  
SE-114 86 STOCKHOLM  
Sweden  
Fax: +46 8 661 91 25

*Admission to the Conference is granted only if Congrex have received the registration fee.*

*For those who have done late payments, please bring copy of your receipt, or Congrex Secretariat will charge your credit card.*

## General Information

Please note that the program outlined in this announcement is preliminary and may be subject to change.

### Venue

NordU2001 – the third NordU/USENIX Conference will be held at Stockholm City Conference Center, Norra Latin, February 12–16, 2001. Tutorial sessions February 12–14 and Conference February 15–16. The commercial exhibition will be held February 14–16.

All matters regarding registration, hotel booking, social events and general information are handled by Congrex Sweden AB. Please contact the Secretariat for questions regarding the program.

### Badges

Each participant will receive a name badge upon registration. For security reasons all participants are requested to wear their badge during the Conference activities and social events. The cost for replacing a lost badge is SEK 400.

## Banks and Post Offices

Banks are open between 09.30–15.00 on weekdays. Some banks in central Stockholm are open 09.00–17.00. Post Offices are generally open between 09.30 and 18.00 on weekdays and 10.00–13.00 on Saturdays. The Post Office at the Central Station is open from 07.00–22.00 on weekdays and 10.00–19.00 during weekends.

## Currency

The official currency is Swedish Krona (SEK)  
USD 1 = app. SEK 9,94  
EUR 1 = app. SEK 8,51  
(October 2000)

## Disclaimer

The Organizing Committee and Congrex Sweden AB accept no liability for injuries/losses of whatever nature incurred by participants, nor loss of, or damage to, their luggage and/or personal belongings.

## How to get to City Conference Center, Norra Latin

City Conference Center (CCC), Norra Latin is located at Drottninggatan 71B in central Stockholm, 5 minutes' walk from the Central Station and the City Terminal (the airport bus terminal). You will find a map at [www.stoccc.se/](http://www.stoccc.se/) and inside the back cover.

## Language

The official language of the Conference is English. No simultaneous translation will be provided.

## Meals

Coffee and lunches are included in the registration fee and will be served daily.

## On site Registration in Stockholm

On site registration will start on February 11 at 16.00. The registration desk and Conference secretariat is located at Norra Latin and will be open during the following hours:

Sunday, February 11	16.00–18.00
Monday, February 12 –	
Thursday, February 15	07.30–17.00
Friday, February 16	07.30–15.00

## Terminal Room

A terminal room will be situated within the Conference venue.  
The terminal room will be open daily during the following hours:

Monday, February 12 –	
Wednesday, February 14	07.00–21.00
Thursday, February 15	07.00–19.00
Friday, February 16	07.00–13.00

## Time Zone

The time zone in Stockholm is GMT + 1 hour.

## Upon arrival at Arlanda Airport / Local transportation

Airport Coaches leave Arlanda Airport (Stockholm's international airport) every 5–10 minutes for the City Terminal in central Stockholm. The bus ride takes approximately 35 minutes and costs SEK 60.

Arlanda Express, a fast-train service, takes you to the Central Station in Stockholm in 20 minutes. A one-way ticket costs SEK 120.

Taxis are available outside the arrival hall at Arlanda Airport. Prices may vary considerably. Therefore it is advised to ask for the price before entering the taxi.

## Web site

For the latest information about the Conference, please visit the Conference web site at:  
<http://www.nordu.org/NordU2001/>

## Cancellations

### Cancellation of Registration

Notification of cancellation must be made in writing and sent to Congrex. Cancellations of registrations will be accepted until January 14, 2001, up to which date the total amount will be refunded less SEK 500 for administrative expenses. We regret that no refunds can be made for cancellations received after January 14, 2001.

### Change of Name

Should you be unable to attend, you will be given the opportunity to send a colleague in your place. An administration fee of SEK 400 will then be charged.

### Cancellation of Hotel Reservation

Notification of cancellation must be made in writing and sent to Congrex. Cancellation of any hotel reservation will be accepted until January 14, 2001, up to which date the hotel deposit will be refunded. We regret that the hotel deposit can not be refunded after January 14, 2001.

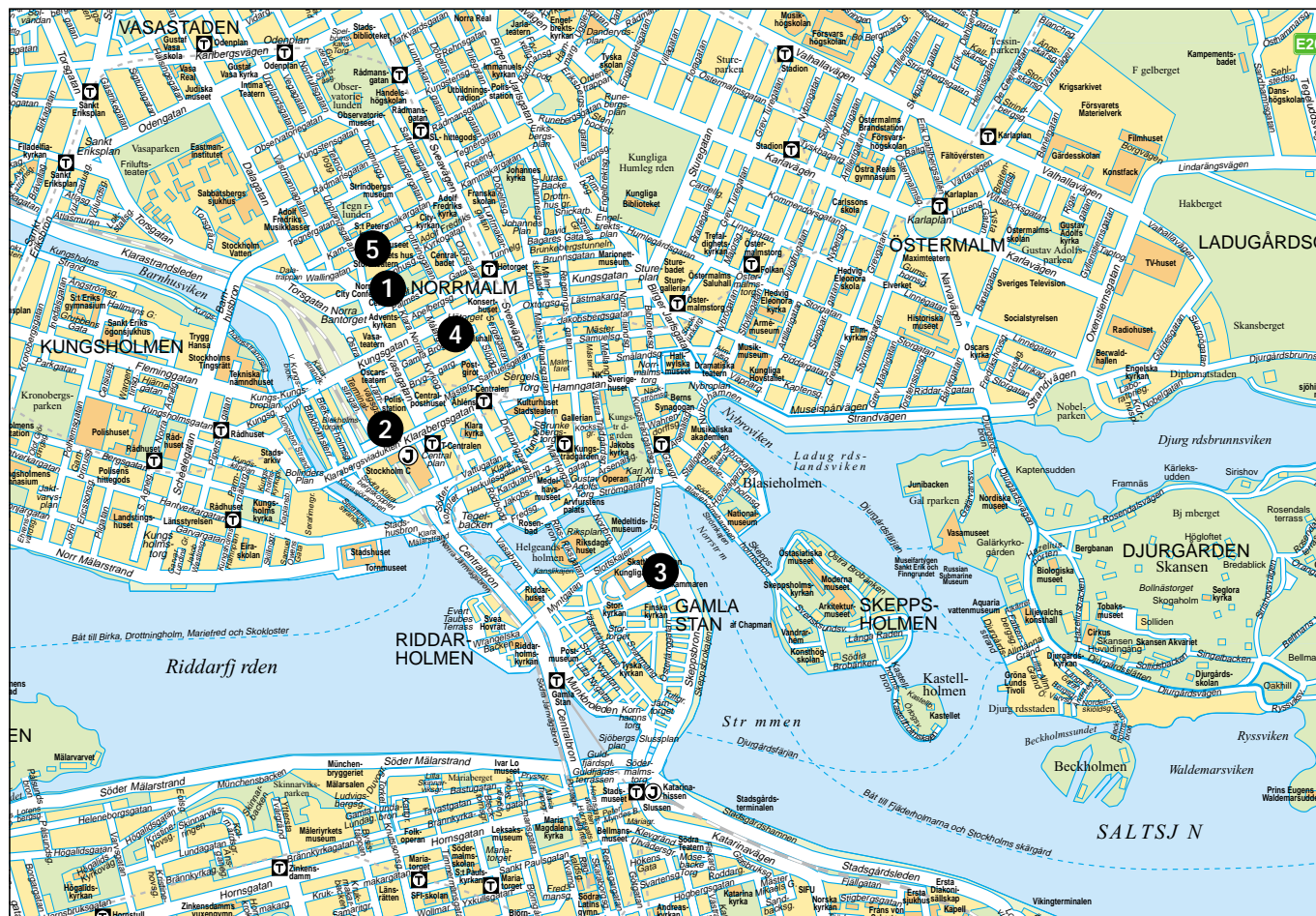
### Cancellation of Social Event

Notification of cancellation must be made in writing and sent to Congrex. Cancellation of social events will be accepted until January 14, 2001, up to which date the total amount will be refunded. Cancellations received after January 14, 2001 are non-refundable.

Additional Copies of this Announcement can be ordered through Congrex.







- 1 Stockholm City Conference Center, Norra Latin
- 2 City Terminal/Central station
- 3 The Royal Palace, The Royal Armoury

- 4 Rica City Hotel (Kungsgatan)
- 5 Wallin Hotel (Wallingatan)

### Scientific Secretariat

Jan Säll  
jan@irial.com

### Local Organizing Committee

Anita Nilsson-Röjning  
anita@europen.se

### Program Committee

Jan Säll, EurOpen.SE and Irial  
Börje Josefsson, EurOpen.SE and Luleå University  
Lars Tunkrans, EurOpen.SE and ICL Invia  
Anita Nilsson Röjning, EurOpen.SE and Uniforum (secretary)  
Lasse Sundström, FUUG  
Vidar Bakke, NUUG  
Kristen Nielsen, DKUUG and Tele Danmark  
Martin Wahlén, SSLUG

### Important Dates

- Deadline for early registration fee: January 14, 2001
- Deadline for hotel reservation: January 14, 2001

### Important Addresses

Conference Administration  
Congrex Sweden AB  
Attn: NordU2001  
PO Box 5619  
SE-114 86 STOCKHOLM  
Sweden  
Phone: +46 8 459 66 00  
Fax: +46 8 661 91 25  
E-mail: nordu2001@congrex.se  
<http://www.nordu2001.org/NordU2001/>

Return address:  
Congrex Sweden AB  
P.O. Box 5619  
SE-114 86 Stockholm  
Sweden

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<http://www.nordu.org/NordU2001>