

# **IPSI-2004s**

**International Conference on Advances in  
Internet, Processing, Systems, and  
Interdisciplinary Research**

*Studenica Monastery, Serbia*  
June 3 - 6, 2004

General Chairman  
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**IPSI-2004s Studenica  
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## ***Message from the General Chairman***

The field of e-business, e-education, and e-science in general is fast growing, and up to now it has been noticed that there is a large body of unpublished knowledge that needs an appropriate forum for its presentation. This was the main rationale behind the idea to organize the IPSI 2004 international conference series.

Authors have been invited from the following three groups: the most referenced computer scientists; the VIPs from important high-tech companies, and the young talents from a list prepared specifically for these conferences. The response, in spite of the many difficulties on the current international scenario, has been more than extraordinary, and justifies the efforts done. Rejection rate of 68% was partially dictated by the size of the Studenica Monastery capacity, and is expected to increase in future. The major theme of this workshop is synergistic interaction of natural language processing, domotica, and networking/software/education.

We would like to sincerely thank everyone who made a contribution to this conference and in particular the authors and the keynote speakers for their time and expertise. A sign of appreciation goes also to all the people who worked hard for making this conference a success: Mirjana Labus (conference manager), Sanida Omerovic, Andrija Bosnjakovic, Aleksandar Stanic, Aleksandra Kovacevic, Damjan Vujnovic, Ivan Toskov, Ivana Vujovic, Jelena Krunic, Laslo Kraus, Lazar Kovacevic, Milos Cvetanovic, Marija Topovic, Nenad Korolija, Predrag Minic, Sasa Rudan, Senad Omerovic, Sinisa Rudan, Svetlana Djokic and Zaharije Radivojevic.

Welcome to the IPSI-2004s conference. We hope you will all enjoy the event as much as we have enjoyed in contributing to its preparation.

Veljko Milutinovic, General Chairman



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**IPSI - 2004s Abstracts**

**IPSI Award Abstracts**

**Authors**



# **IPSI-2004s Abstracts**



## **Generic Intelligent Personal Information Agent**

*Sahin Albayrak, Dragan Milosevic*

The aim of this paper is to present one personalization model being based on generic modeling mechanisms through which specialization, profile adaptation and exploration are deployed. While for the user's specialization one novel adaptable feature weighting scheme is developed, the exploration of new information areas is achieved through the application of attribute collaborative filtering. The strength of the developed personalization model is the possibility to support systems in different application domains. Its applicability is already proved in the sensitive domain of recommending travel offers, and it is on a good way to be also proved in the personal information retrieval.

## **Linux File Systems comparison: ext3 vs ext2**

*B. Đorđević, S. Mišković, D. Pleskonjić, N. Maček and V. Milutinović*

This paper concentrates on the Linux filesystem performance comparison problem. Compared filesystems include Linux native second extended filesystem (ext2) and its backward compatible successor, third extended filesystem (ext3). Main goal this paper should achieve is analysis of performance impact due to a new approach called journaling, implemented by Novell ext3 filesystems. Although journaling increases reliability, the impact it has on filesystem performance is rather interesting. Three journaling modes (journal, ordered and write-back) are included. The performance is measured using Postmark and Bonnie++ benchmark software and some custom tests defined by the authors.

## **eBusiness in South America**

*Alejandro Bedini G. and Oscar Saavedra*

The companies to be able to survive in century XXI, must implement two premises quality and eBusiness. But south America are this prepared to face the paradigm of ebusiness? which is the present and future situation of this region? How the small companies can confront this situation? The following paper must by objective expose the present and future situation of the region exposing the cases of success that exist at the moment. With special Attention to Chile's ebusiness and how need some efforts for the TFC (Trade free commerce) with USA and Europe.

## **Estimation of the Speedup of Distributed Applications**

*Wlodek M. Zuberek*

Speedup is one of the main performance characteristics of distributed applications. It is defined as the ratio of application's execution time on single processor to the execution time, of the same workload, on a system composed on N processors. This paper analyzes, in very general terms, the speedup that can be achieved in distributed environment and shows why some applications scale very well with the number of processors while others have strict limitations of the speedup that can be achieved in distributed environments. The existence of such limitation simply means that a straightforward distribution of a (sequential) workload is not a satisfactory approach, and new algorithms are needed to use distributed environments in a more satisfactory way.

## **Convergence of Voice and Data Services in Ethernet-based Metropolitan Area Networks**

*Antonella Brachetti, Aurelio La Corte, Antonio Puliafito, Sabrina Sicari*

The adoption of solutions where voice and data networks are integrated into an IP-based network infrastructure allows the implementation of new and sophisticated services and leads users to a new degree of satisfaction. In this paper we present a practical case study of telecom convergence carried out in the university campus sites, which are interconnected by a private E-MAN (Ethernet-based Metropolitan Area Network). The design factors, such as quality of service (QoS) parameters and total cost of network ownership, that have been considered in order to decide to adopt a technical solution based on voice and data integration, are pointed out. A general model for the representation of QoS is also illustrated, for taking into account the different point of view of customers, service providers and telecommunication engineers.

## **A Supernova in Storage Management for IPSI-Studenica 2004**

*Steve HALLADAY, Charles MILLIGAN, and Steven McCOWN*

Market disruption is defined as a sudden revolutionary change in market ownership and is extremely hard to predict. Disruption is generally noted after the fact when a seemingly irrelevant technology matures in some market niche. The technology then suddenly can be applied and crosses over into larger established markets. The application of the new technology is exciting, but the business implications are generally terrifying. Conventional market leaders almost always yield entrenched market positions to newcomers.

This paper identifies a potential storage subsystem architecture that could now emerge that has potential to disrupt current storage markets and produce new market leaders. This storage system architecture is based upon a confluence of several innovative technologies that have each developed in their own specific market niches and are now mature and ready for more general application. The technologies in question include Peer-to-peer connectivity, RAID style redundancy mechanisms, Virtual Private Network (VPN) technology, and an economic systems management model. The combining methodology is the maturity of the Open Source development approach. This paper describes the salient characteristics of each of these technologies, describes how and why the combination of these characteristics influence disruption, and points out the few remaining technological barriers that inhibit this disruption. More importantly, this paper describes the storage management vortex that will fuel this immanent disruption.

## **Models of Active Worm Defenses**

*David M. Nicol, Michael Liljenstam*

The recent proliferation of Internet worms has raised questions about defensive measures. To date most techniques proposed are passive, in-so-far as they attempt to block or slow a worm, or detect and filter it. Active defenses take the battle to the worm—trying to eliminate or isolate infected hosts, and/or automatically and actively patch susceptible but as-yet-uninfected hosts, without the knowledge of the host's owner. The concept of active defenses raises important legal and ethical questions that may have inhibited consideration for general use in the Internet. However, active defense may have immediate application when confined to dedicated networks owned by an enterprise or government agency. In this paper we model the behavior and effectiveness of different active worm defenses. Using a discrete stochastic model we prove that these approaches can be strongly ordered in terms of their worm-fighting capability. Using a continuous model we consider effectiveness in terms of the number of hosts that are protected from infection, the total network bandwidth consumed by the worms and the defenses, and the peak scanning rate the network endures while the worms and defenses battle. We develop optimality results, and quantitative bounds on defense performance. Our work lays a mathematical foundation for further work in analysis of active worm defense.

## **A study on the impact of organizational learning to the effectiveness of Electronic Document Management Systems**

*Vincent Cho*

Processing documents electronically can improve productivity, upgrade quality of product, avoid redundancy and improve the customer service, etc. A popular system used in Hong Kong is Electronic Document Management system (EDMS), which is an electronic way to manage and organize the document more easily. It is an advanced solution for companies to manage and organize tons of documents in the office. On the other hand, organizational learning is the development of new knowledge of insights that have the potential to influence behavior. It was a measurable organizational capability – one that could be developed over time, and one that could be directly towards the achievement of competitive advantage. Organizational learning can also help companies to maintain or improve performance based on experience. It is believed that there is a relationship between organizational learning and EDMS effectiveness but rare researches have done on this topic. This research is to explore impact of organizational learning on EDMS effectiveness. A questionnaire with three main parts (organizational learning, EDMS effectiveness and common factors affecting the two constructs) is formulated and sends to supervisors, middle managers and senior executives. Structural Equation Modeling is used for the analyses. It is found that management support is the most important factors in our model and may improve organization's performance in different ways. Recommendations to managers and academics are also included in this paper.

## **PSTN/Internet Convergence and IP Telephony (with QOS and Wireless Applications): Architectures and Protocols (Tutorial)**

*Igor Faynberg, Hui-Lan Lu*

This tutorial clearly defines "convergence" (as symbiosis of the PSTN and Internet) is produced, at which point a review of the PSTN technologies and standards follows: The overall structure of PSTN (transmission, switching, and network management), ISDN and the Signalling System No. 7 (SS No. 7) and its stack with the examples of use of access (Q.931) protocol, ISDN User Part (ISUP) and transaction Capabilities Application Part (TCAP) protocols. Intelligent Network (as the key to the PSTN and wireless services) Following the review of the PSTN, the Internet principles and protocols are reviewed: Internet structure, architecture and principles; basic protocols (TCP/IP); Simple Network Management Protocol (SNMP); e-mail protocols; Quality of Service (QOS) protocols: Resource reSerVation setup Protocol (RSVP); Differentiated Services (DIFFSERV) model and protocol; and Multi-Protocol Label Switching (MPLS). The IP telephony transport and signaling protocols: RTP, RCTP, H.323, and SIP. The tutorial is concluded with the converged services examples and scenarios: IETF

## **Interdisciplinary Research and Globalization**

*Raka Shome*

This paper examines the relationship between interdisciplinary research and globalization. Before saying any more, let me briefly state that much of what follows is being argued primarily in the context of the Social Science and Humanities in the U.S (and the West), since my academic location is in this sphere. In particular, my thoughts emerge from my own location in the field of communication studies. Specifically, they emerge from the influential research area of cultural studies that studies everyday culture--global, national, local, racial, sexual, gendered etcetera--as a site of politics through which hegemonic power structures are maintained in society. Cultural studies--an intensely interdisciplinary field that traverses English, Geography, Communications, Education, Anthropology, Sociology, Political Science, Women's Studies, Ethnic Studies and others--is usually seen as a research area whose avowed political aim is decidedly democratic and whose goals are to theorize social inequities. Thus, as I speak of interdisciplinarity, I speak from within this area of expertise. As I am not in the hard sciences or engineering, I do not claim to be an expert on disciplinary politics in those fields. But I do think that much of what I say below--given that they address larger politics of the academy especially in the U.S.--would also have bearing on these fields. I am interested in exploring the implications of interdisciplinarity in the context of various conjunctures and disjunctures of globalization.

## **Virtualization layer in multi-domain metadata probe**

*Perry Merrit, Jelena Krunic, Zoran Babovic*

In order to better manage data, storage providers must have the ability to perform such functions as file relocation, file replication, file consolidation, and file migration. Storage providers have been providing these functions using such terms as HSM, log-structured files and snapshot for years. Unfortunately, these implementations are relegated to single server/single storage-pool environments. The virtualization layer in multi-domain metadata probe seeks to provide a static name space for storage consumers while allowing a dynamic allocation scheme for storage providers. The layer will reside at the network layer and will act as a switch between a set of consumer/clients and provider/servers. Allowing such concepts as Information Lifecycle Management (ILM) to become more than marketing buzzwords.

## **MPEG Multiplexer**

*Jelena Krunic, Nenad Korolija, Zoran Babovic*

MPEG Multiplexer is a software tool for multiplexing MPEG Video and MPEG Audio Streams into an MPEG System Stream. It is full implementation of ISO/IEC 13818-1(MPEG2 System) and ISO/IEC 11172-1 (MPEG1 System) standards. This software tool is designed in UML, then implemented in C++ for better performance. An easy interface is provided to the programmer which wants to exploit this software in own project. Both version, for Windows and Linux, are available.

## **VHDL Structured Logic Design**

*Ivan Dugic*

The main purpose of this tutorial is introduction to modern approach of ASIC (Application Specific Integrated Circuit) design, concerning some of the basic structured design concepts, hardware description languages use and the most important VHDL features (VHDL is De facto industry standard as hardware description language). Special emphasis is put on the design process highlights (testing, simulation) based upon experience on MAC (Multiply Accumulator) development project (as part of prof. Veljko Milutinovic's course dedicated to microprocessor design for VLSI).

## **Acceleration of Watermarking**

*Ivana Vujović, Darko Jović, and Veljko Milutinović*

Watermarking is a process of embedding information into digital data in a secret and inconspicuous way. Today watermarking is widely used in applications of copyright protection, fingerprinting, copy protection, content authentication, data hiding, etc. We can classify watermarking in two general categories: spatial domain and frequency domain watermarking. In frequency domain watermarking, media is transformed from spatial to frequency domain, then some watermarking algorithm is applied, and finally watermarked data is transformed back to spatial domain. Additionally, for some media types, certain decoding and encoding operations can take place before and after watermarking algorithm is applied. In this paper, methods for acceleration of watermarking process will be presented. These methods are not referring to watermarking algorithm itself, but rather to optimizations of spatial/frequency domain transformations, as well as optimizations of encoding/decoding operations.

## **SwanLink Network Application**

*Fred B. Holt, Virgil Bourassa, Andrija Bosnjakovic, Nenad Korolija, Predrag Minic, Jovan Popovic*

This paper presents a new intensity-based technique for interactive teaching over the network. The goal of this project is to develop a network layer for P2P communication between network nodes. Application provides environment in which potential users are informed about what other users are working on their workstations. Each user can draw, input text and images, and post that to other users on the network. The paper discusses several practical aspects of problems that affect the accuracy of the method and proposes some solutions.

## **The Digital Sealed File System (DSFS) - Needs and Used Techniques**

*Aleksandra Z. Kovacevic, Sasa M. Rudan, and Veljko Milutinovic*

Various disciplines and techniques have attracted our attention during this research, searching for the answer on the problem contained in this one sentence: "Find a mechanism to guarantee that a file stored in a conventional file system, on disk, has not been modified." Even though these techniques were often just rambles, they were still helping us to have a multidisciplinary approach to the problem and thereby maybe used to find an imperceptible interdisciplinary relation crucial for the final solution of the stated problem. These techniques include watermarking, cryptography, digital signature and smart card technology and the analysis and some important issues of those will be explained and exposed in this paper.

## **The Digital Sealed File System (DSFS) - The Architecture**

*Sasa M. Rudan, Sinisa M. Rudan, Aleksandra Z. Kovacevic, and Veljko Milutinovic*

The main problem our research is dealing with is how to protect data against undetectable modification. Data that we are almost always dealing with are confidential data, law evidence, or business papers and they are usually stored in Whitehouse. The main idea of our research is in the existence of main authority that will appear in the some point of time and it will put digital stamp on certain data. This stamp will stand for origin authenticity of data as like as for last-modification-time authenticity (i.e. timestamp). The conclusion is standing in the main problem of whole concept: no one can have authority or even possibility to alter or recreate data or their corresponding stamp without notice. One can see that there is not allowed any kind of central trusted authority. Also he/she can see that there is no need for protecting against modification but only against undetectable modification.

## **Distributed Soft-Realtime Systems as Basis of Low Cost Defense Systems**

*Predrag Minic*

Defense systems usually have similar structures; they are mostly built around high power computers used for intense calculations of projectile trajectory in cooperation with detection equipment. Goal of this paper is to present a network of low cost computers as a part of multi layered soft-realtime based defense system. It tends to use low quality detection equipment and probability based calculations on it's peers to achieve accuracy.

## **Constraint Programming**

*Novakovic Nikola*

Constraint Programming is an emergent software technology for declarative description and effective solving of large, particularly combinatorial, problems especially in areas of planning and scheduling. This presentation will cover short history of Constraint Programming technology, explain basic Constraint Satisfaction techniques, discuss implementation and importance of this technology and give some limitations and challenges that stands in front of Constraint Programming.



# **IPSI Award Abstracts**



## **Award papers/presentations from past IPSI organized conferences!**

### **TV is Dead – Long Live the WEB (SSGRR-2000)**

*Harold Kroto, Nobel Laureate, University of Sussex, UK*

Science, Engineering and Technology are as vital to our intellectual and cultural development (particularly our children's) as they are to our training to get along in the Modern World. Some efforts to redress the problems involved in the general Public awareness and understanding of science and engineering (PAUSE) issues are being initiated via the Vega Science Trust ([www.vega.org.uk](http://www.vega.org.uk)), which aims to take advantage of the revolution in TV and Internet communications technology to improve matters. The best scientists and science communicators are being recorded and the programmes are being broadcast on BBC-TV and the Internet. Furthermore School/University outreach programmes are being developed and Vega is piloting ways in which members of the Science, Engineering and Technology (SET) community can, as individuals and groups, make important contributions. Excerpts from SET programmes will be presented. These efforts present a perspective on SET which places the cultural factors in the foreground and focuses on the intrinsic charisma of science which is hidden from many. It is now crucial that the society in general and the scientific community in particular accept that serious problems are involved in communicating science and the Internet is set to play a major role. Before the invention of the printing press there was only one book in the west – the bible – and it was hand-written by monks. After the invention the printing press book – writing and reading was democratized and this was truly the beginning of general education. In a similar way the birth of the Internet has democratized broadcasting – the broadcasting channels no longer control the dissemination of recorded material – individuals and groups of individuals can now do it themselves and so the Internet has enabled broadcasting to fulfill the promise it has always had – to be a superb educational medium.

### **Electronic Business and Education (SSGRR-2001)**

*Bob Richardson, Nobel Laureate, Cornell University, USA*

There is no longer any question that the Internet and electronic communication are the major new tools for collaborative advances in the creation of new knowledge and in future learning. There are countless examples of highly successful professional courses taught on the Internet. Similarly, international and multidisciplinary collaborations in scientific research based upon little contact other than through electronic communication dominate the scientific literature. Perhaps the most profound examples of distance collaboration in science are found in astronomy. The Hubble telescope has permitted astronomers to gather breathtaking images from the most remote observatory imaginable – one in orbit around the earth. A significant challenge remains. The challenge is to devise a remote mode for nonverbal communication about difficult concepts. In the shared creation of new ideas and knowledge, facial expressions and body gestures frequently play an important role in peer interactions. As the speed and bandwidth of electronic communication increase, we have the prospect that the important elements of human contact can be imitated. Without the development of sympathetic peer or mentor relationships, distance learning will remain quite sterile.

### **E-Business and E-Challenges (SSGRR-2002)**

*Jerome Friedman, Nobel Laureate, MIT, USA*

The development of Homo sapiens has been a history of innovations, from the earliest crude tools to the modern technological society of today. The growth of science and technology has been exponential during the last century; and under the right circumstances, this rapid growth can be expected to continue. The major innovations of the future - those that will shape the society of the future - will require a strong foundation of both basic and applied research. It is ironic that quantum mechanics, one of most abstruse conceptual frameworks in physics - one that was developed to explain atomic spectra and the structure of

the atom, lies at the foundation of some of our most important technological developments, because it provided the understanding of semiconductors that was essential for the invention of the transistor. Quantum mechanics thus contributed directly to the development of technologies that gave us world wide communication, computers with their applications to all phases of modern life, lasers with many diverse uses, consumer electronics, atomic clocks, and superconductors - just to mention a few. The internet and the World Wide Web, which are profoundly reshaping the way that we communicate, learn, and engage in commerce, owe their origins in a deep sense to the physicists of the past who worked to understand the atom. In modern industrial nations, quantum mechanics probably lies at the basis of a sizable fraction of the gross national product. This is but one example, and there are many others in all areas of science that demonstrate this point. It is clear that innovation is the key to the future and the human drive to understand nature is the key to future innovation. Society must do all that it can to preserve, nurture and encourage curiosity and the drive to understand.

### **The Next Generation of IP – Flow Routing (SSGRR-2003)**

*Lawrence G. Roberts, Father of the Internet, USA*

For the last 33 years IP routers have not changed, they still support only "best effort" traffic. However, the bandwidth available to people has been increasing rapidly with the advent of broadband access. The result is that many new services are now desired that require far better QoS than "best effort" IP can support. Also, with broadband, the problem of controlling the total usage and carrier expense has become important. Thus, it has become critical to improve both the delay performance and the control of bandwidth for IP service, much as was accomplished in ATM. Also, call rejection for high bandwidth streaming services like video is required instead of random discards if quality is to be maintained. All these problems can be solved with no change to TCP/IP by routing flows rather than packets. This requires keeping some state information for the duration of the flow, but this information can be captured on the fly as the first packet goes by. This permits an IP flow router to achieve all the capabilities of an ATM switch, but without the call setup delay and at a lower cost than a conventional IP router.

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