

Research Report 2003/04

Research Group on Computer Networks and Distributed Systems

Personnel

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Research Projects

National Competence Center in Research for Mobile Information and Communication Systems (NCCR-MICS)

The NCCR-MICS (<http://www.mics.ch>) project was launched in 2001. Its goal is to study fundamental and applied research questions raised by new generation mobile communication and information services, based on self-organization. Such systems have become very topical lately with the advent of mobile

ad-hoc, peer-to-peer, and sensor networks. Yet, many of the fundamental questions remain to be solved. NCCR-MICS is composed of eleven research projects, and the RVS group of the University of Berne is participating in the individual project "Self-Organizing Networking Mechanisms" (IP4), which aims at investigating the main networking issues in ad-hoc networks in a broad sense. Specifically, the RVS research group is doing research on two topics: Routing and TCP in mobile ad-hoc networks.

In the area of routing the focus is on the topic of position-based and energy conserving routing for sensor and vehicular ad-hoc networks. Most of today's routing protocols for mobile ad hoc networks are not well-suited for large and highly mobile ad-hoc networks like sensor networks and vehicular ad-hoc networks. They are primarily focusing on rather small networks, where the number of nodes is up to several hundreds and have little mobility. Hence, these constraints have to be overcome when designing a routing protocol for this environment. Position information available at each node is the key enabler for a new class of protocols, called position-based routing protocols, which exploit location information to enhance routing. We propose the BLR (Beacon-Less Routing) protocol that avoids periodic beacon broadcast. It is state-less in the sense that nodes do not need to store information about the neighborhood. BLR was implemented in a realistic network simulator. Results from simulations indicate that BLR provides superior performance under various network conditions compared to other position-based routing protocols that use beacons. Especially in scenarios with mobility the performance of BLR remains basically unaffected by the movement of the nodes. Thus, BLR provides efficient and robust routing in highly dynamic mobile ad-hoc networks and is also more scalable as it causes almost no routing overhead.

In the area of transport protocols, we investigate techniques for improving TCP performance on an end-to-end basis. One problem of TCP in such environments is its inability to distinguish losses induced by the lossy wireless channel from the ones due to network congestion. Traditional TCP decreases its sending rate sharply when packet losses occur in order to reduce the network load. But this could be just the wrong approach if the packet loss occurred due to the wireless medium. We have proposed and evaluated a fuzzy logic engine for performing packet loss discrimination in short multihop networks in terms of number of hops between sender and receiver. Simulation evaluations showed that this technique provides effective discrimination in such scenarios, and its response time is satisfactory in most cases. Another main problem is that TCP requires acknowledgments for its transmitted data packets (segments), which is costly in the shared wireless medium in place. We are currently working on a dynamic adaptive acknowledgment strategy to minimize the number of transmissions and retransmissions in the shared transmission medium. The key idea is to minimize the number of unnecessary transmissions (via minimization of ACKs), which may provide not only better bandwidth utilization but also lower energy consumption.

Research staff

Marc Heissenbüttel, Ruy de Oliveira, David Jörg, Thomas Staub. MICS Internship Students: Thomas Bernoulli, Cécile Grivaz, Till Bohbot, Markus Wälchli, Isabel Steiner

Financial support

Swiss National Science Foundation Project No. 5005-067322 and University of Bern

Virtual Internet and Telecommunications Laboratory of Switzerland (VITELS)

VITELS (<http://vitels.unibe.ch>) is part of the 1st series of the Swiss Virtual Campus (SVC) projects and will continue within the SVC consolidation program until June 2006. The goal was to develop an e-learning course in English language that provides theory and practical hands-on exercises in the area of telecommunications / computer networks with real network hardware for third year computer science students. Actually, VITELS consists of nine modules, five designed and maintained by University of Bern. University of Bern now operates also some modules of other partners.

We developed the course infrastructure further and connected VITELS to the Swiss authentication and authorization infrastructure (AAI) implementation, together with the developed AAI portal. Ongoing work consists in maintaining the running modules.

The course is operational and has been used in lectures. We are in the process of moving the modules to recently delivered hardware. During the consolidation, tasks like didactical and technical updates are planned. A first action is the adaptation of the WebCT CE course implementation to the WebCT Vista implementation operated by Edutech.

The RVS group was granted the Microsoft Research Curriculum Request for Proposal Award to develop a distance learning course module in the area of Internet Security.

Research staff

Marc-Alain Steinemann, Attila Weyland, Stefan Zimmerli, Thomas Spreng, Christine Rosenberger, Florian Baumgartner, Roland Balmer

Financial support

Bundesamt für Bildung und Wissenschaft (BBW), Virtual Campus Switzerland Project No. 991043, and University of Bern

Authentication and Authorization Infrastructure (AAI) Portal

An Authentication and Authorization Infrastructure (AAI, <http://www.switch.ch/aai/>) consists of systems that simplify the mobility of network services users. In Switzerland, SWITCH started establishing an AAI for universities and related organizations. Student's data remain at the respective university, called home organization, as well as the authentication process. Resource providers that connect to the AAI, such as universities and related organizations, receive authenticated users on their resources.

A disadvantage of an AAI is that resources must be adapted to it. In many cases this is not possible, for example when the resource code is not open source. In other cases it might be too expensive to adapt a single resource to the AAI.

The AAI portal that has been developed is located between the core AAI and the resource provider. The AAI portal simplifies the process of connecting non-AAI-enabled resources to the AAI and adds interesting features for students and resource users.

We have successfully finished this mandate and handed over the architecture documentation and the code to SWITCH. The source code is available at <http://aai-portal.sourceforge.net/>.

Research staff

Marc-Alain Steinemann, Thomas Spreng, Karl Guggisberg, Attila Weyland, Calogero Butera

Financial support

Virtual Campus Switzerland Mandate, and University of Bern

Advanced Architecture for Inter-Domain Quality-of- Service Monitoring, Modeling, and Visualization (InterMON)

InterMON (<http://www.ist-intermon.org>) was an EU-IST project with 12 participants from several European countries within the 5th Framework Program of the EU. It aimed to develop an architecture for monitoring, modeling, simulation and visualization of inter-domain quality of service. University of Bern was leading work package 5, which was concerned with developing efficient modeling and simulation techniques to support scalable simulation of large inter-networks.

The main focus of the work package 5 during this final phase of the project was on the integration of the various tools in the Intermon simulation toolkit with the global architecture, and on evaluation of these tools. The deliverable "Evaluation of Inter-Domain QoS Modeling, Simulation and Optimization" describes the evaluation work. Contributions to several other deliverables have also been made, see Intermon deliverables at technical reports section.

The "hybrid simulation" concept developed by the University of Bern achieves scalability by combining analytical models for network domain clouds (usually autonomous systems) and inter-domain links with classical packet-based simulation techniques. A mechanism to integrate these analytical models into the packet-based ns-2 simulator has been implemented. The resulting hybrid simulator and its integration into the Intermon architecture have been successfully tested and evaluated using two testbed networks, located at Salzburg Research and the University of Bern, respectively.

Research staff

Florian Baumgartner, Matthias Scheidegger

Financial support

EU project IST-2001-34123, Bundesamt für Bildung und Wissenschaft (BBW) Nr. 01.0551

eXperience Based Admission Control (XBAC)

End system based Admission Control (EAC) is a concept where applications first measure the available bandwidth before starting the real data transmission (e.g. video streaming). If the measurement indicates insufficient quality of service, the end system does not admit the transmission to proceed. The EAC approach has several disadvantages, especially the relatively long measurement phase (in the order of seconds) and the waste of resources during the measurement phase.

The XBAC project aims to establish an infrastructure of special servers, which both allow applications in close proximity of a server to share their experience regarding quality of service. The servers provide a "measurement service" for applications. This aggregation of experience and measurement data may result in better QoS predictions, shorter probing intervals, and a significant reduction in measurement overhead on the network. To further improve predictions the XBAC servers can exchange information using a peer-to-peer network.

Research staff

Matthias Scheidegger

Financial support

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Mobile IP Telephony (MIPTel)

The MIPTel project aims to develop and support mobile telephony applications over IP networks. Providers are in great need of scalable, extensible, flexible as well as transparent charging and accounting methods, which take into account the specific attributes of wireless networks and the requirements of diversified services. A wide range of accounting, charging and pricing schemes have been analyzed.

Our research focuses on cooperation and accounting strategies in multi-hop cellular networks. With multi-hop cellular networks the coverage area can be increased and the installation costs for the provider can be reduced. However, the individual customers play an important role in such networks and their participation must be encouraged.

We proposed a scheme called CASHnet (Cooperation and Accounting Strategy in Hybrid Networks), which makes cooperation a rewarding alternative, but allows selfishness at the same time. We took a highly decentralized approach for the accounting as well as for the security architecture. Accounting is done on the device and authentication is based on public key cryptography.

We implemented CASHnet in ns2 and made extensive evaluations regarding network liveliness and overall throughput. Currently we work on the comparison of our scheme with other cooperation schemes, on possible improvements of CASHnet and on the implementation of a prototype using SmartCards.

Research staff

Attila Weyland and Thomas Staub

Financial support

Swiss National Foundation Project No. 2100-057077.99/2 and 20-68086.02/1

QoS Support for the Internet based on Intelligent Network Elements (QuINE)

The QuINE project made use of intelligent network elements providing more flexible network management mechanisms allowing the network provider to offer additional services. In particular, QoS support based on Differentiated Services and various multicast mechanisms should be provided.

A Java based central policy server approach was implemented using COPS (Common Open Policy Service) for the communication inside the network. The security of an earlier version of the software was improved in order to detect situations in which two different users submit the same authentication information.

Evaluations have shown that a central instance for policy control can represent a bottleneck in terms of performance. Thus, a new concept for flexible service establishment has been developed. In this concept, most of the configuration decisions are done inside the network by active components. Only the decisions that need a global network view are performed by a central entity. The concept addresses security as well, by controlling the authenticity of the information and the authorization of the user.

Another activity within the Quine project has been the further extension of the Virtual Router platform as well as the development and implementation of a Java based Active Router (JVAR) with a special focus on video processing and signaling. The systems allow to react on network events, either by signaling event occurrence to a central management station, or by automatically triggering certain actions to cope with the new situation. Standard services like adaptation of video coding, automatic configuration of encryption and compression mechanisms have been implemented. The system is able to establish tunnels dynamically and therefore allows to route traffic on specific paths through the network. Besides load balancing this mechanism also allows to create security services like splitting of a single data stream and transporting its parts along different paths. This prevents suspicious nodes to monitor the complete data flow and, combined with proper coding, increases security with low overhead. The implementation is very flexible and provides a set of standard services as well as a framework for service creation. The framework especially enforces the implementation of proof classes for each new service, which allows to test new elements before installing them into the network, and therefore increasing the stability of the whole system. The JVAR system has been implemented and can be used without significant modifications on top of Virtual Routers as well as on standard Linux routers. A simple interface between the active elements and the router allows the quick adaptation to different router platforms. Since the performance of Java is rather limited, only certain transcoding tasks may be accomplished within the JVAR itself, while for more complex tasks external, native libraries have to be used, which are supported by the JVAR platform. Especially on a Virtual Router infrastructure with multiple routers and JVARs on a single host, the performance is of course an issue, since the computer has not only to cope with the load of Virtual Routers and their communication, but also with resource consumption of the active elements. However, even a scenario with multiple active routers is sufficient for small experiments, low packet rates or if the scenario is mainly used for monitoring and management tasks, which cause less processing load.

Research staff

Florian Baumgartner, Roland Balmer, Marc Brogle, Dragan Milic

Financial support

Swiss National Foundation Project No. 2000-06624.01/1

Cellular Assisted Heterogeneous Networking (CAHN)

Existing radio technologies like wireless LAN, Bluetooth, GPRS or Ultra Wide Band (UWB) allow communication between different mobile devices like mobile phones, PDAs or laptops. These wireless technologies require appropriate configuration to work in a desired manner. Too often, more than a basic know-how about the technology itself is required to understand the different settings needed to interconnect devices. With the CAHN approach, this configuration is performed automatically and transparently for the user.

The bandwidth limitation of nowadays cellular networks like GSM/GPRS is a big disadvantage in the competition against broadband wireless radio technologies such as wireless LAN, Bluetooth or UWB, which are much more appropriate for fast data transfer. But on the other hand, the cellular networks benefit from the high coverage and the "always on" characteristics. The paging of a mobile device that is attached to the cellular network is a common functionality. Therefore, the cellular network is very well meeting the requirements of a signaling plane. Taking these facts into account, a framework for Cellular Assisted Heterogeneous Networking has been developed, where the cellular network serves as the signaling plane for wireless broadband data channels.

The implementation of a prototype was done for the communication establishment based on CAHN for Bluetooth and WLAN spontaneous networking. The implementation offers a GUI where users can invite peers to join a private peer to peer connection. The connection setup is then done automatically based on SMS communication. Three patents covering the main aspects of such an implementation have been submitted and are pending. The adaptations required on the CAHN protocol to cope with other signaling channels like Unstructured Supplementary Service Data (USSD) or IP based communication were designed and will be implemented, as well as support for heterogeneous data links between involved nodes. Therefore, the next release of the prototype will offer a faster and more flexible platform for setting up and maintaining heterogeneous spontaneous networks among mobile or fixed nodes. Integration of Mobile IP based communication is also in progress.

Research staff

Marc Danzeisen, Isabel Steiner, Simon Winiker, Ehsan Maghsoudi

Financial support

Swisscom Innovations AG

Multimedia Transmission in Mobile Ad-hoc Networks

Efficient transmission of real-time data such as audio and video is a challenging task, in particular in mobile ad-hoc networks. After performing the initial research investigating the related work in this field, we identified hybrid (wired/wireless) networks to be a very promising area. The work focussed on improvements of the handover and delivery time in hybrid networks. We have developed an architecture which allows the node to keep the same IP address even if the Internet access point has changed. This approach saves time needed for Mobile IP handover. The developed architecture can also be used for improving communication by using wired shortcuts in the ad-hoc network. Next research work will continue investigating possibilities given by the hybrid (wired/wireless) network as well as decreasing the handover time between wireless nodes in order to improve multimedia transmission quality.

Research staff

Marcin Michalak

Peer-to-Peer Networks for Mobile and Multicast Communications

Peer-to-Peer Networks are not only becoming important for applications as file sharing, but derived mechanisms can also be useful for supporting different communication scenarios.

First, we investigated Application Level Multicast as a promising approach to overcome the deployment problems of IP level multicast. Application level multicast is typically supported by peer-to-peer or overlay networks. We have developed a mechanism that allows selecting a particular multicast delivery tree out of a set of n alternative multicast delivery trees, which might be established on top of an overlay network. The set of alternative multicast trees consists of the default multicast tree and up to $n-1$ backup multicast trees. Each backup multicast tree is characterized by the fact that exactly one link of the default multicast tree is replaced by a backup link from the set of available links. The so-called backup multicast tree algorithm can calculate this set of trees with a complexity of $O(m \log n)$. The backup multicast tree algorithm is the basis for the reduced multicast tree algorithm that can calculate a tree, which results from the default multicast tree by removing a particular node and by replacing the links of the removed node. Explicit multicast tree selection can also be useful to support the case of leaving nodes in secure application level multicast communications.

Another investigated problem is the minimization of authentication delays when mobile users roam across different wireless networks. The basic idea is to avoid exchanging security information between networks visited by a roaming user and the user's home authentication, authorization, and accounting (AAA) server that is typically located in the home network possibly far away from the visited network. Instead, the authentication of a roaming user shall be supported by an AAA server in the visited network. We propose that the AAA server that is responsible for authorization in a newly visited network locates the AAA server in the previously visited network and retrieves the required security information from that AAA server. The AAA servers can be organized in a peer-to-peer manner and peer-to-peer mechanisms can be applied for searching and transferring security information between them. Several mechanisms for locating the previously responsible AAA server have been evaluated by simulations. Performance measurements also show the rather low performance overhead of application level forwarding used in peer-to-peer networks.

Research staff

Torsten Braun

Financial support

Institut National de Recherche en Informatique et en Automatique, Sophia-Antipolis, France

TCP in Sensor Networks

Although new application-specific routing and transport protocols are required in sensor network, the Transmission Control Protocol (TCP) should also be supported by sensor nodes, since TCP might be required for controlling and managing sensor nodes. As an example, new code might have to be downloaded from a base station in a reliable way. Recent work shows that TCP can be implemented efficiently on sensor nodes without consuming too much CPU and memory resources. Another issue is to minimize the energy consumption in such a network when a TCP connection is established between a sensor node and a base station via several intermediate sensor nodes. A promising approach is to cache TCP segments inside the sensor network in order to avoid end-to-end retransmissions. We are currently working on improvements of this concept by allowing not only the nodes along the path to cache segments but also nodes in the direct neighborhood of the path, which might have received forwarded TCP segments too. A simulation model has been implemented in Omnet++ which will serve as a basis for future performance analysis. Other related issues are the development of a backpressure scheme to avoid useless transmissions by a sender into the sensor network in case of congestion and error situations as well as adapting header compressions schemes to sensor networks.

Research staff

Torsten Braun

Financial support

Swedish Institute of Computer Science, Kista, Sweden

Testbed for Mobile and Internet Communications

The RVS research group maintains its own testbed network for various purposes. One part of the testbed is used to build networks of experimental routers and end systems in order to be able to evaluate the behavior of new networking procedures and architectures in a realistic environment. Another part of the network forms a productive network of Linux PCs and provides the storage capacity and CPU power for many of the RVS group's projects. For example, the MICS and InterMON projects use the CPU power of the machines to run specialized simulators, with focus on node mobility and large inter-domain topologies, respectively. The InterMON project further uses the testbed for its CVS, FTP and mailing list archive servers, as well as for parts of the web site. Two systems have also been connected to the so called global controller of the InterMON project. An educational lab network for students' training is also connected to the testbed. The whole testbed is IPv6-enabled and is connected to the 6bone via SWITCH.

Research staff

All members of the RVS research group

Diploma Theses

- Dragan Milic: Java Policy Server, May 2004
- Simon Winiker: Integration of Cellular Assisted Heterogeneous Networking and Bluetooth Service Discovery Protocol, May 2004
- Calogero Butera: Accounting and Information Exchange Services on a Resource Management Portal, May 2004
- Silvia Stattenberger: HTTP-Servererweiterung zur dynamischen Anpassung der Übertragungsrate, April 2004
- Marc Brogle: JVAR: Java Virtual Active Routing, April 2004
- Christine Rosenberger: Theory and Hands-on Exercises for E-Learning on Distributed Systems, January 2004

Further Activities

Memberships

- Editorial Board of Elsevier's Computer Communications Journal (Torsten Braun)
- Editorial board of Informatik Spektrum / Springer-Verlag (Torsten Braun)
- Swiss Representative of COST 290 Action "Traffic and QoS Management in Wireless Multimedia Networks" (Torsten Braun)
- SWITCH Stiftungsrat (Torsten Braun)
- SWITCH Stiftungsratsausschuss (Torsten Braun)
- SWITCH Tariff Working Group (Torsten Braun)
- SPEEDUP Society Committee (Torsten Braun)
- Kuratorium Fritz-Kutter-Fonds (Torsten Braun)
- Ph.D. Jury at University of Grenoble (Torsten Braun)
- Ph.D. Jury at University of Nice (Torsten Braun)

- Expert for Diploma Exams at Fachhochschule Bern (Torsten Braun)
- Steering Committee member of the Swiss IPv6 Task Force (Torsten Braun)
- Core team member of the Swiss IPv6 Task Force (Florian Baumgartner)
- SWITCH Projektausschuss (steering committee) ‘‘e-Academia / Authentifizierungs- und Autorisierungs-Infrastruktur (AAI): Pilot-Phase’’ (Marc-Alain Steinemann)

Conference Program Committees

- Workshop on Challenges of Mobility, part of 18th World Computer Congress WCC 2004, Toulouse, France, August 22-27, 2004 (Torsten Braun)
- NETWORKS 2004, Vienna, Austria, June 13-16, 2004 (Torsten Braun)
- Third International IFIP-TC6 Networking Conference, Athens, Greece, May 9-14, 2004 (Torsten Braun)
- 13th IEEE Workshop on Local and Metropolitan Area Networks (LANMAN 2004), San Francisco Bay Area, USA, April 25-28, 2004 (Torsten Braun)
- IEEE Workshop on High Performance Switching and Routing (HPSR 2004), Phoenix, Arizona, USA, April 18-21, 2004 (Torsten Braun)
- Workshop on End-to-End Service Differentiation (EESD 2004), Phoenix, Arizona, USA, April 5, 2004 (Torsten Braun)
- International Conference on Wired/Wireless Internet Communications (WWIC 2004), Frankfurt (Oder), Germany, February 04-06, 2004 (Torsten Braun)
- International Conference on Next Generation Teletraffic and
Wired/Wireless Advanced Networking (NEW2AN'04), St.Petersburg, Russia, February 02-06, 2004 (Torsten Braun)
- IEEE Consumer Communications and Networking Conference, Las Vegas, Nevada, USA, January 5-8, 2004 (Torsten Braun)
- International Workshop on Multimedia Interactive Protocols and Systems, Napoli, Italy, November 18-21, 2003 (Torsten Braun)
- The 28th Annual IEEE Conference on Local Computer Networks (LCN), Bonn/Königswinter, Germany, October 20-24, 2003 (Torsten Braun)
- Workshop on High-Speed Local Networks (HSLN) as part of the IEEE LCN conference, Bonn/Königswinter, Germany, October 21, 2003 (Torsten Braun)

- 14th IFIP/IEEE International Workshop on Distributed Systems: Operations & Management (DSOM'03), Heidelberg, Germany, October 20-22, 2003 (Torsten Braun)
- Workshop on Quality of Future Internet Services (QoFIS), Stockholm, Sweden, October 1-3, 2003 (Torsten Braun)
- Third International Workshop on Internet Charging and QoS Technology (ICQT 2003), Munich, Germany, September 16-19, 2003 (Torsten Braun)

Reviewing Activities

- Schweizerischer Nationalfonds (SNF) (Torsten Braun)
- Hong Kong Research Grant Council (Torsten Braun)
- International Conference on Communications (ICC 2004) (Torsten Braun)
- Journal of Network and Systems Management (Torsten Braun)
- Elsevier's Computer Networks Journal (Torsten Braun)
- IEEE Journal on Selected Areas in Communications (JSAC) (Torsten Braun)
- Kluwer Academic Publications (Torsten Braun)
- Elsevier's Journal on Simulation Practice and Theory (Torsten Braun)
- University of Armed Forces München (Torsten Braun)
- Purdue University (Torsten Braun)

Invited Talks and Tutorials

- Torsten Braun: A Beacon-Less Routing Mechanism for Wireless Multi-Hop Networks, Swedish Institute of Computer Science (SICS), Kist/Stockholm, Sweden, August 24, 2004
- Marc Heissenbüttel: Beacon-Less Routing as a Possibility to Enhance Position-Based Routing, The MICS (Mobile Information and Communication Systems) Annual Workshop 2004, Zürich, Switzerland, July 06, 2004
- Torsten Braun: Network Emulation, Internet Nouvelle Generation (ING), Obernai, France, June 15, 2004
- Marc Danzeisen: SESAM Von einer Diplomarbeit zum Produkt, Technologietransfer von der Forschung in die Wirtschaft, Forum Bern, Bern, Mai 25, 2004
- Torsten Braun: Peer-to-Peer Networks for Mobile Communications and Multicast Support, INRIA, Sophia-Antipolis, France, May 5, 2004
- Torsten Braun: A Beacon-Less Routing Mechanism for Mobile Ad-Hoc Networks, Eurecom, Sophia-Antipolis, France, May 3, 2004
- Ruy de Oliveira: Packet Loss Discrimination in Ad Hoc Networks, Purdue University, West Lafayette, USA, March 31, 2004

- Marc Danzeisen: P2P Systems and Applications Seminar, Schloss Dagstuhl, Germany, March 7-10, 2004
- Ruy de Oliveira: An End-to-end Approach for Improving TCP Performance in Ad Hoc Networks, EPFL, Lausanne, Switzerland, January 29, 2004
- Torsten Braun: Broadband Multimedia Applications, Università della Svizzera Italiana, Lugano, Switzerland, January 27, 2004
- Torsten Braun: End-to-End Mechanisms for QoS Support in Wireless Networks, COST 279 Mid-Term Workshop, Rome, Italy, January 22, 2004
- Torsten Braun: Authentication and Authorization in the Internet, Schweizer Informatiktag, Bern, Switzerland, October 17, 2003
- Torsten Braun: Next Generation Internet Protocols for Optical Network Environments, SPIE ITCOM, Orlando, USA, September 11, 2003

Organized Events

Schweizer Informatiktag

The RVS Group hosted the swiss informatics day 2003 (Schweizer Informatiktag) on behalf of the Swiss Computer Science Society (SI). The event aimed at bringing together the Swiss community involved with Computer Science related topics. It event provided room for topical presentations and meaningful discussions on current and future trends on informatics in Switzerland.

Vitels Information Day and Telematiktag Bern

University of Bern is the leading house of the Virtual Internet and Telecommunications Laboratory of Switzerland (VITELS). This event was promoted by the RVS Group to show VITELS' development process, its constructivist concept and how well established the course has been. VITELS demonstrations were also presented in the Telematiktag Bern event, where the main functionalities of the system were exhibited.

Institutional Research Cooperation

The RVS group maintains an effective collaboration with the RAID laboratory at Purdue University in the United States. RAID belongs to the Department of Computer Science of that University, and focuses on research involving various topics within computer networking field. As part of such a collaboration, the RVS group hosted Prof. Dr. Bharat Bhargava of Purdue University in a technical visit of two weeks on December 2003.

Prof. Dr. Torsten Braun spent his sabbatical in summer semester 2004 at INRIA (Institut National de Recherche en Informatique et en Automatique) Sophia Antipolis (February 09 to May 08) and SICS (Swedish Institute of Computer Science) Kist/Stockholm (July 26 to October 17).

Publications

Reviewed Journal and Conference Papers

- Marc Heissenbüttel, Torsten Braun, Thomas Bernoulli, and Markus Wälchli: BLR: Beacon-Less Routing Algorithm for Mobile Ad-Hoc Networks, Elsevier's Computer Communications Journal, vol. 27, no. 11, July 2004, ISSN 0140-3664, pp. 1076-1086
- Attila Weyland, Thomas Staub, and Torsten Braun: Liveliness Evaluation of a Cooperation and Accounting Strategy in Hybrid Networks, 4th Workshop on Applications and Services in Wireless Networks (ASWN 2004), Boston, MA, USA, August 8-11, 2004
- Roland Balmer and Torsten Braun: Resource Control and Authentication for a Video Streaming Service in a DiffServ/IP Multicast Network, 3rd Conference on Security and Network Architectures (SAR04), La Londe, Cote d'Azur (France) June 21-25, 2004, pp. 359-368
- Matthias Scheidegger, Florian Baumgartner, and Torsten Braun: Simulating Large-Scale networks with Analytical Models, Analytical and Stochastic Modelling Techniques and Applications (ASMTA2004), 18th European Simulation Multiconference, (ESM 2004), Magdeburg, Germany, June 13-16, 2004, ISBN 3-936150-38-9, pp. 13-16
- Attila Weyland and Torsten Braun: Cooperation and Accounting Strategy for Multi-hop Cellular Networks, 13th IEEE Workshop on Local and Metropolitan Area Networks (LANMAN 2004), Mill Valley, CA, USA, April 25-28, 2004, pp. 193-198
- Attila Weyland and Torsten Braun: CASHnet - Cooperation and Accounting Strategy for Hybrid Networks, 2nd Workshop on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt 2004), Cambridge, UK, March 24-26, 2004, pp. 423-424
- Florian Baumgartner, Matthias Scheidegger, and Torsten Braun: Simulating Router- and Domain Characteristics, International Workshop on Inter-Domain Performance and Simulations (IPS2004), Budapest, Hungary, March 21-22, 2004, ISBN 963-421-592-0, pp. 139-145
- Ruy de Oliveira and Torsten Braun: A Delay-based Approach Using Fuzzy Logic to Improve TCP Error Detection in Ad Hoc Networks, IEEE Wireless Communications and Networking Conference (WCNC 2004), Atlanta, USA, April 21-25, 2004, ISBN 0-7803-8344-3, pp. 1666-1671
- Maurizio Bartoli, Florian Baumgartner, Christof Brandauer, Torsten Braun, Sandor Kardos, Fabrizio Orlandi, Matthias Scheidegger, and Jörn Seger: The Intermon Simulation Framework, International Workshop on Inter-Domain Performance and Simulations (IPS2004), BudaPest, Hungary, March 21-22, 2004, ISBN 963-421-592-0, pp. 130-138
- Erich Bircher and Torsten Braun: An Agent-Based Architecture for Service Discovery and Negotiations in Wireless Networks, 2nd International Conference on Wired/Wireless Internet Communications (WWIC 2004), Frankfurt (oder), Germany, February 04-06, 2004, ISBN 3-540-20954-9, pp. 295-306

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- Stefan Egger and Torsten Braun: Multicast for Small Conferences A Scalable Multicast Mechanism Based on IPv6, IEEE Communications Magazine, Vol. 42 Issue 1, January 2004, ISSN 0163-6804, pp. 121-126
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Patents

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Awards

Microsoft Research Curriculum Request for Proposal Award granted

The Computer Networks and Distributed Systems research group as part of the Institute of Computer Science and Applied Mathematics at the University of Bern has been granted a Microsoft Research Curriculum Request for Proposal Award for the development of a distance learning course module in the area of Internet Security.

Fritz-Kutter Award 2002/2003

The dissertation Dynamic Service Provisioning in IP Networks received the prestigious Fritz-Kutter award for the best practice oriented Ph.D. thesis in Computer Science in whole Switzerland during the academic year 2002/2003. The thesis was written by Ibrahim Khalil and supervised by Prof. Dr. Torsten Braun.

Ruy de Oliveira 2004-08-25