

1 Research Group on Computer Networks and Distributed Systems

1.1 Personnel

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* with financial support from a third party

1.2 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 with the advent of mobile ad-hoc, peer-to-peer, and sensor networks. NCCR-MICS is composed of eleven research projects, and the RVS group of the University of Berne has been 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.

Current routing protocols for ad-hoc and sensor networks require neighbor information in order to optimize routing of packets. This neighbor information is acquired through hello messages, which are broadcast periodically by each node. These transmissions however consume scarce network resources such as battery-power and bandwidth. Furthermore, they do not always provide accurate information about the positions because the movements of the nodes frequently result in very suboptimal forwarding decision in highly dynamic networks. We earlier had proposed the BLR (Beacon-Less Routing) protocol that avoids periodic transmission of hello messages and therefore avoids the aforementioned drawbacks. It is state-less in the sense that nodes do not need to store information about their neighborhood. The results obtained from simulations indicate that BLR provides superior performance under various network conditions compared to other position-based routing protocols that use hello messages. In addition, we implemented the BLR protocol in a real world test bed. The test bed consists of Linux laptop computers equipped with IEEE 802.11 WLAN cards and GPS receivers. The results obtained from the conducted experiments showed that BLR is able to deliver packets with a very short delay over multiple hops. The same principle used for the (unicast) routing protocol BLR has been applied to the design of a broadcast protocol DDB (Dynamic Delayed Broadcasting). DDB is also able to locally optimally transmit packets without knowledge about the neighborhood and, thus, without any control traffic. This allows flooding a packet very efficiently in the network to every node. Simulation results indicate that it outperforms clearly current state-of-the-art broadcast protocols for mobile ad-hoc networks.

Furthermore, the AMRA (Ants-based Mobile Routing Architecture) was implemented in a network simulator. AMRA proved its potential in large ad-hoc networks with irregular topology where routing between the source and destination node is not possible along a straight line. AMRA was able to find much shorter paths by circumventing voids in the network topology. As the used network simulator was limited in the number of supported nodes, we also implemented a simple Java-based network simulator which allows for the simulations of even larger networks. The obtained results confirmed the results of previously performed simulations with the other network simulator. AMRA found paths that were up to 50% shorter than with using other routing protocols also in the very large networks.

To improve the performance of the transport control protocol (TCP) in multihop wireless networks, we have proposed a technique that minimizes the traffic overhead inherent in this protocol. Specifically, we have developed the dynamic adaptive acknowledgment (DAA) strategy to reduce redundant transmissions as well as unnecessary retransmissions toward higher end-to-end throughput. The key concept of this technique is to use the medium's scarce bandwidth smartly by reducing redundant acknowledgements whenever the wireless channel is unconstrained. For that, the receiver monitors the channel continuously and changes its acknowledgement transmission rate accordingly. This scheme does not only enhance throughput but also reduces energy consumption in many scenarios. In addition, our approach requires changes at the end nodes only, facilitating deployment. Since DAA targets environments facing moderate loss rates, DAAP (DAA plus) was later proposed for noisier channels. DAAP pre-

vents the TCP sender from missing acknowledgements when packet loss is high. As a result, fewer retransmissions caused by timeouts take place at the sender, leading to higher performance. The key concept in DAAp is the more conservative strategy at the receiver regarding the combination of acknowledgements when recovering from lost packets. Simulation evaluations have shown that both DAA and DAAp outperform traditional TCP as well as related work in a variety of scenarios.

Research Staff Marc Heissenbüttel, Ruy de Oliveira, Thomas Bernoulli, Markus Wälchli, Thomas Huber, David Jörg. Internship students: Natalie Boerger and Akcelik Derman

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

Virtual Internet and Telecommunications Laboratory of Switzerland (VITELS)

VITELS, a first series Swiss Virtual Campus (SVC) project has been funded within the SVC consolidation program, which is running until June 2006. The VITELS goal has been to develop an e-learning course in English language that provides theory and practical hands-on exercises in the area of telecommunications and computer networks with real network hardware for computer science students. Currently, VITELS consists of eight modules, six designed and maintained by University of Bern, one by University of Neuchatel, and one by University of Fribourg. The course is fully operational and has been productively used in different regular courses at the Universities of Bern, Fribourg, and Neuchatel.

In the reporting period we have further developed the VITELS file formatting tool FFGF (file framework generator & formatter) to a more user-friendly version and subsequently updated the course content files to fit the new tool. FFGF relieves course designers from the task of formatting course content for different platforms. Designers write the course content, formatted with pre-defined style markers (HTML tags), which are then processed by FFGF. The output files currently match the dimensions and style requirements of WebCT Vista and CE but more output formats can be included if necessary. FFGF also helps designers to manage the table of contents of their learning modules. The tool integrates static text automatically and generates a graphic schedule and chapter title overviews. Simultaneously, we have improved the didactical concept and integrated changes resulting from our teaching experiences with students. The content of our e-learning modules has been reviewed and updated. The hands-on sessions of various modules have been moved to new hardware. Unified systems installation procedures make maintenance easier now. Moreover, the development of an improved course management system with student profiles and a much more flexible hands-on sessions' reservation system has been started. Upgrades to new versions of the Shibboleth based authentication and authorization infrastructure have been performed.

Research Staff Marc-Alain Steinemann, Attila Weyland, Florian Baumgartner, Thomas Staub, Thomas Bernoulli, Daniel Frey, Jana Krähenbühl, Reto Gantenbein, Torsten Braun

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

End-to-end Quality of service support over heterogeneous networks (EuQoS)

The *EuQoS* project (<http://www.euqos.org>), which started on September 1 2004, aims to resolve the outstanding design issues presently associated with the delivery of end-to-end Quality of Service (QoS) across heterogeneous networks. With the help of EuQoS these issues should be solved and network infrastructures should be upgraded so that new applications can be supported by the Internet and new service packages can be offered by operators, Internet and other service providers. Our research group is involved in the workpackages WP1, WP3, WP5 and WP6.

WP1 aims to define an architecture for different aspects of the EuQoS system. QoS support for IP multicast is difficult to achieve due to the lack of wide IP multicast deployment in the Internet, and it seems that this will probably not change in the near future, even with adoption of IPv6. Our research focuses on providing a transparent support for application level multicast on end systems to enable multicast communication across the Internet using only unicast communication offering QoS support.

WP3 delivers the proposed applications and services according to the architectures defined in WP1. Our research group provides an implementation of a transparent multicast facility known as “Multicast Middleware”, which is based on a virtual network interface (TAP) and is implemented mostly using Java to support different operating systems. The Multicast Middleware aims to be independent of the underlying QoS mechanisms. It can either use the EuQoS QoS signaling (introduced with the EuQoS project) or it can use measurement-based QoS to bridge gaps where only Best-Effort service is offered by the underlying network.

WP5 builds a testbed environment in which the developed prototypes and applications can be tested and evaluated. Different heterogeneous networks (WLAN, UMTS, LAN, xDSL, etc.) are interconnected in a full mesh among the partners. Our testbed represents a high speed LAN-based network, which is interconnected by General Routing Encapsulation (GRE) tunnels to 10 other testbeds belonging to all other EuQoS consortium partners involved in WP5.

WP6 (Dissemination, Standards and Training) focuses on delivering the project results to the public. This shall be achieved by four activities, namely development of training material, delivery of training, standardization contributions, as well as dissemination by demonstrations and publications. In addition to leading and managing the whole work package, our main contributions address the training activities. Within this context, a course focusing on QoS related topics is being developed for students and industrial learners. The goal of the course is also to raise the familiarity with QoS technologies for next generation networks and applications. The course is based on distance learning technologies and consists of seven QoS related modules. We have developed the

didactical concept of the e-learning course and are coordinating its implementation. In particular, we are implementing the course modules “Applications’ QoS demands” and “Implementing protocols on network simulators.” We are further developing and providing the course management system and the authentication & authorization framework required for the various module exercises.

Research Staff Thomas Bernoulli, Marc Brogle, Dragan Milic, Thomas Staub, Marc-Alain Steinemann, Torsten Braun

Financial Support EU project IST-2003-004503

eXperience Based Admission Control (XBAC)

The XBAC project aimed to create an overlay network architecture that provides a distance estimation service to user applications. Before an application opens a connection to a remote endpoint it can ask the service for a prediction of the quality of service to this destination. Depending of the prediction it can then decide to proceed with connection setup, or to back off. Moreover, peer-to-peer networks can use the service to optimally configure their topology and also to adapt to later changes in quality of service.

The XBAC architecture is based on the idea of creating clusters of endpoints that are close to each other in the physical network topology. While communicating these endpoints gather measurement data, which they distribute to the other endpoints in their cluster. Thereby they create a common pool of network measurements, termed the group’s *experience*. Using this experience, the cluster can give robust answers to QoS prediction requests. If the request cannot be answered (e.g. when the request concerns two remote clusters) the local cluster may also communicate with other clusters to fulfill the request. Clustering of endpoints is also useful to reduce the complexity of QoS prediction since the number of required prediction models is significantly reduced.

To create such an architecture a method to remotely identify clusters, based on time series of QoS measurements, has been defined. Furthermore, we have developed a basic architecture for experience exchange and data organization within clusters, as well as communication between clusters. It is based on distributed hash tables (DHTs) and therefore achieves high robustness.

Research Staff Matthias Scheidegger

Financial Support Swiss National Foundation Project No. 200021-101679/1

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 and transparent charging and accounting methods, which take into account the specific attributes of wireless networks and 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 uncooperative nodes at the same time. We took a decentralized approach for the accounting as well as for the security architecture. The charging and rewarding is done on the device, the transformation of the rewards is performed at central service stations. Service stations are terminals with a low-bandwidth connection to the accounting center of a provider, much like a loading station for pre-paid cards. The authentication is based on public key cryptography.

We implemented CASHnet in ns2 and made extensive evaluations regarding network liveliness and overall throughput. We compared CASHnet to Nuglet and found that CASHnet outperforms Nuglet using two or more service stations. As a result of further analysis, we improved CASHnet in several ways. We increased the granularity of the rewarding messages and improved the simulation scenario. We are currently analyzing the effect of reseller nodes and mobile service stations in CASHnet via simulations. We are also implementing a prototype of CASHnet under Linux using Netfilter to conduct some real-life performance measurements.

Research Staff Attila Weyland, Thomas Staub

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

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.

After having set up a demonstrator for CAHN last year, a simulator was built this year to quantify the benefits introduced by the CAHN concept. Therefore, a new framework called SMACS (Smart Multi-Access Communication Service)

was developed. The SMACS framework integrates CAHN and enables the seamless handover from infrastructure to ad-hoc and peer-to-peer links provided by CAHN. SMACS therefore extends the concept of separating the signaling from the data plane for heterogeneous data sessions to any kind of IP network. The simple and convenient session establishment achieved with CAHN has consequently been adapted to work with ad-hoc and infrastructure based links. Nowadays academic but also commercially available network simulators (ns2, Qualnet, OpNet, etc.) do not provide appropriate support for the simulation of heterogeneous networks with dynamic vertical handovers during runtime, end-to-end communication between nodes using different wireless technologies simultaneously, and switching between infrastructure and ad-hoc mode of operation. Therefore, we implemented our own network simulator that allows the modeling of heterogeneous networks at a simplified level, i.e. no packet transmission are simulated. Simulations have shown, that the throughput can be increased about 80% in certain scenarios. The two features offered by the CAHN framework, namely the ad-hoc and the on-demand capability, are promising increased networking experience not only for the user, but also for the operator, in terms of better battery lifetime and more efficient resource utilization.

Research Staff Marc Danzeisen, Isabel Steiner

Financial Support Swisscom Innovations AG

Power Saving in Wireless Ad hoc Networks

Power saving strategies generally attempt to maximize the time that nodes spend in a low power consumption sleep state. Such strategies often require the sender to notify the receiver about pending traffic using some form of traffic announcements. Although asynchronous traffic announcement mechanisms are particularly suitable for the ad hoc environment, they also provide relatively limited power savings. We propose a mechanism that improves the efficiency of asynchronous traffic announcement mechanisms by reducing the proportion of time that nodes need to spend awake, while still maintaining good connectivity properties. The mechanism is based on allowing traffic announcements to be rebroadcast by neighbouring nodes. Performance evaluation by analysis and simulation showed the usefulness of the mechanism for single-hop scenarios. Preliminary investigations have been performed for multi-hop scenarios.

Research Staff Torsten Braun

Financial Support Swedish Institute of Computer Science, Kista, Sweden

TCP in Sensor Networks

Many applications of wireless sensor networks require external network connectivity to enable communication between monitoring / controlling entities and sensors. By using the TCP/IP protocols inside the sensor network, external connectivity can be achieved to any other IP node at the edge or outside the sensor network. TCP can be used for remote management, configuration and

reprogramming of sensor nodes as well as for query distribution. In case, TCP is just deployed at end points, high bit error rates cause a high number of end-to-end retransmissions leading to energy inefficiencies that reduce the lifetime of a sensor network. TCP Support for Sensor nodes (TSS) allows intermediate sensor nodes to cache TCP segments and to perform local retransmissions in case of errors. TSS should be deployed in each sensor node along the path of a TCP connection in order to allow energy efficient operation and to improve performance of TCP connections in a sensor network. TSS extends related work such as Distributed TCP Caching (DTC) by functions such as TCP acknowledgement recovery and easy to deploy backpressure based congestion control. Simulations performed with Omnet++ showed that TSS can improve the performance of DTC and also proves the effectiveness of the backpressure mechanism.

Research Staff Torsten Braun

Financial Support Swedish Institute of Computer Science, Kista, Sweden

Security and Privacy in the Internet

In spring 2004 the Computer Networks and Distributed Systems research group 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.

We have completed our course called “Security and Privacy in the Internet,” which addresses both theoretical and practical aspects of the subject. The theoretical part covers a wide range of topics – from vulnerabilities over attacks and countermeasures to general security mechanisms and concepts. In the practical part the course participant has the possibility to set up and validate a Kerberos installation.

The course has been developed based on the VITELS Didactics and Design Guide. The theory consists of HTML code and interactive Flash animations. It is available as stand-alone package or WebCT content. The laboratory consists of several Linux computers running a Kerberos installation and has been integrated into the VITELS reservation system.

Research Staff Attila Weyland, Florian Baumgartner

Financial Support Microsoft Research Curriculum Request for Proposal Award

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. The XBAC project for example uses the available CPU power to perform computations

on time series of QoS measurements. Furthermore, the a significant part of EuQoS project's testbed is located within the RVS testbed. It is a Gigabit LAN environment of 10 machines for pan-european trials, and it is connected via IP tunnels to 11 partners' sites. The available CPU power is used by three network traffic measuring points. An educational lab network for students' training is also connected to the testbed. Moreover, a practical exercise for the students of the operating systems lecture has been realized using a Linux server in the RVS lab.

Research Staff All members of the RVS research group

1.3 Diploma Theses

- David Jörg: Ants-Based Routing in Mobile Ad-Hoc Networks , January, 2005
- Thomas Huber: Ant-Based Mobile Routing Architecture in Large-scale Mobile Ad-hoc Networks, January, 2005
- Markus Wälchli: Optimized Position-based Routing and Broadcasting in Mobile Ad-hoc Networks, December, 2004
- Thomas Bernoulli: Beacon-less Routing in Mobile Ad Hoc Networks, November, 2004
- Thomas Staub: Implementating a Cooperation and Accounting Strategy for Multi-hop Cellular Networks, November, 2004
- Ehsan Maghsoodi: Design and Implementation of WLAN Support for Cellular Assisted Heterogeneous Networking, November, 2004

1.4 PhD Theses

- Ruy de Oliveira: Addressing the Challenges for TCP over Multihop Wireless Networks, June, 2005
- Marc-Alain Steinemann: Distributed Architectures for Laboratory-Based E-Learning, June, 2005
- Marc Heissenbüttel: Routing and Broadcasting in Ad-hoc Networks, June, 2005

1.5 Further Activities

Memberships

- Editorial Board of Elsevier's Computer Communications Journal (Torsten Braun)
- Editorial Board of Informatik Spektrum / Springer-Verlag (Torsten Braun)
- Erweitertes Leitungsgremium GI-Fachgruppe "Kommunikation and Verteilte Systeme" (Torsten Braun)

- Management Board of EU IST project EuQoS (Torsten Braun)
- Swiss Representative, Management Committee Member, and Working Group Chair of COST 290 Action “Traffic and QoS Management in Wireless Multimedia Networks” (Torsten Braun)
- SWITCH Stiftungsrat (Torsten Braun)
- SWITCH Stiftungsratsausschuss (Torsten Braun)
- Kuratorium Fritz-Kutter-Fonds (Torsten Braun)
- Ph.D. Jury at University of Nice (Torsten Braun)
- Expert for Diploma Exams at Fachhochschule Bern (Torsten Braun)
- Swiss Authentication and Authorization Infrastructure Advisory Committee (Marc-Alain Steinemann)

Conference Program Committees

- International Workshop on Quality of Future Internet Services (QoffIS), Barcelona, Spain, September 29 – October 1, 2004 (Torsten Braun)
- 4th International Workshop on Advanced Internet Charging and QoS Technologies (ICQT), Barcelona, Spain, September 29 – October 1, 2004 (Torsten Braun)
- 12th IEEE International Conference on Network Protocols (ICNP), Berlin, Germany, October 5 – 8, 2004 (Torsten Braun)
- International Working Conference on Active Networking (IWAN), Lawrence, USA, October 27–29, 2004 (Torsten Braun)
- 15th IFIP/IEEE Distributed Systems: Operations and Management, Davis, USA, November 15–17, 2004 (Torsten Braun)
- Workshop on High-Speed Local Networks, in conjunction with IEEE LCN Conference, Tampa, USA, November 16–18, 2004 (Torsten Braun)
- 29th IEEE Conference on Local Computer Networks (LCN), Tampa, USA, November 16–18, 2004 (Torsten Braun)
- Second International Workshop on Multimedia Interactive Protocols and Systems (MIPS), Grenoble, France, November 16–19, 2004 (Torsten Braun)
- 15th IFIP/IEEE International Workshop on Distributed Systems: Operations & Management (DSOM 2004), Davis, USA, November 15–17, 2004 (Torsten Braun)
- Global Internet & Next-Generation Networks Symposium, at the 2004 IEEE Global Communications Conference (GLOBECOM 2004), Dallas, USA, November 29 – December 3, 2004 (Torsten Braun)

- Workshop “Internet Compatible QoS in Ad hoc Wireless Networks” (IC-QAWN), in conjunction with 3rd ACS/IEEE International Conference on Computer Systems and Applications, Cairo, Egypt, January 3–6, 2005 (Torsten Braun)
- IEEE Consumer Communications and Networking Conference, Las Vegas, USA, January, 3–6, 2005 (Torsten Braun)
- 2nd Annual Conference on Wireless On demand Network Systems and Services (WONSS), St. Moritz, Switzerland, January, 19–21, 2005 (Torsten Braun)
- 14. Fachtagung “Kommunikation in Verteilten Systemen,” Kaiserslautern, Germany, February 28 – March 3, 2005 (Torsten Braun)
- 3rd International Workshop on Internet performance, simulation, monitoring and measurements (IPS-MoMe), Warsaw, Poland, March 14–15, 2005 (Torsten Braun)
- 4th IFIP International Conference on Networking, Waterloo, Canada, May 2–6, 2005 (Torsten Braun)
- 3rd International Conference on Wired/Wireless Internet Communications (WWIC), Xanthi, Greece, May 11–13, 2005 (Torsten Braun, TPC Chair)
- IEEE International Workshop on Management Issues and Challenges in Mobile Computing, Nice, France, May 15, 2005 (Torsten Braun)
- 9th IFIP/IEEE International Symposium on Integrated Network Management (IM 2005), Nice, France, May 15–19, 2005 (Torsten Braun)
- IEEE International Conference on Communications (ICC), Seoul, South Korea, May 16–20, 2005 (Torsten Braun)
- International Conference on Information and Communication Technology in Management (ICTM), Melaka, Malaysia, May 23–25, 2005 (Torsten Braun)
- 4th Conference on Security and Network Architectures (SAR), Batz sur Mer, France, June 6–10, 2005 (Torsten Braun)
- Symposium on Ad Hoc Networks, as part of WirelessCom 2005, Maui, USA, June 13–16, 2005 (Torsten Braun)
- Workshop on Real-World Wireless Sensor Networks (REALWSN), Stockholm, June 20–21, 2005 (Torsten Braun)
- International Conference on Internet Computing (ICOMP), Las Vegas, USA, June 27–30, 2005 (Torsten Braun)
- 5th Workshop on Applications and Services in Wireless Networks, Paris, France, June 29 – July 1, 2005 (Torsten Braun)
- 31st EuroMicro Conference, Porto, Portugal, August 30 – September 3, 2005 (Torsten Braun)

Reviewing Activities

- United States-Israel Binational Science Foundation (Torsten Braun)
- Indo Swiss Joint Research Programme, EPF Lausanne (Torsten Braun)
- Swiss National Science Foundation (Torsten Braun)
- IEEE Communications Magazine (Torsten Braun)
- IEEE Transactions on Mobile Computing (Torsten Braun)
- Journal of Network and Systems Management, Springer Science and Business Media (Torsten Braun)
- 61st IEEE Semiannual Vehicular Technology Conference, Stockholm, Sweden, May 30 – June 1, 2005 (Torsten Braun)
- Journal on Wireless Communications and Mobile Computing, John Wiley (Torsten Braun)

Invited Talks and Tutorials

- Torsten Braun: Telematiknetze, Kaderkurs Telematik, Bundesamt für Bevölkerungsschutz, Schwarzenburg, Switzerland, March – May, 2005
- Torsten Braun: A Dynamic Adaptive Acknowledgment Strategy for TCP over Multihop Wireless Networks, 2nd COST 290 meeting, Wi-QoST: Traffic and QoS Management in Wireless Multimedia Networks, University of Haute Alsace, Colmar, France, February 3, 2005
- Torsten Braun: Sicherheit und Dienstgütemunterstützung in verteilten Kooperationsumgebungen, Fakultät Elektrotechnik und Informatik, TU Berlin, Germany, May 9, 2005

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 during July 2005. Prof. Dr. Torsten Braun spent parts of his sabbatical from at SICS (Swedish Institute of Computer Science) Kista/Stockholm (July 26 to October 17).

1.6 Publications

Publications submitted in the academic year 2004/2005 and appearing in 2005/2006 or later are not listed.

Reviewed Journal and Conference Papers

- Marc Danzeisen, Torsten Braun, Isabel Steiner, and Daniel Rodellar: On the Benefits of Heterogeneous Networking and How Cellular Mobile Operators Can Help, International Conference on Parallel Processing Workshop (IEEE WSNET 2005), Oslo, Norway, June 14–17, 2005, ISBN 0-7695-2381-1, pp. 366–371
- Marc Heissenbüttel, Torsten Braun, Tobias Roth, Thomas Bernoulli: GNU/Linux Implementation of a Position-based Routing Protocol, IEEE ICPS Workshop on Multi-hop Ad hoc Networks: from theory to reality (REALMAN 2005), Santorini, Greece, July 14, 2005, ISBN 960-531-179-8, pp. 25-33
- Marc Heissenbüttel, Torsten Braun, David Jörg, and Thomas Huber: A Framework for Routing in Large Ad-hoc Networks with Irregular Topologies, Fourth Annual Mediterranean Ad Hoc Networking Workshop (Med-Hoc-Net 2005), Île de Porquerolles, France, June 21-24, 2005
- Marc Heissenbüttel, Torsten Braun, Thomas Huber, and David Jörg: Routing in Large Wireless Multihop Networks with Irregular Topologies, 5th Scandinavian Workshop on Wireless Ad-hoc Networks (ADHOC'05), Stockholm, Sweden, May 3–4, 2005
- Torsten Braun, and Laura Marie Feeney: Power Saving in Wireless Ad hoc Networks Without Synchronization, 5th Scandinavian Workshop on Wireless Ad-hoc Networks (ADHOC'05), Stockholm, Sweden, May 3–4, 2005
- Torsten Braun, Matthias Scheidegger, and Marco Studer: Virtual Dropping for Endpoint Admission Control, IEEE E2EMON Workshop, Nice, France, May 15, 2005, ISBN 0-7803-9249-3, pp. 177-186
- Torsten Braun, Thomas Spreng, and Marc Steinemann: An Authentication and Authorization Architecture for the Mobile Internet, IEEE International Workshop on Management Issues and Challenges in Mobile Computing (MICMC2005), Nice, France, May 15, 2005
- Attila Weyland, Thomas Staub and Torsten Braun: Comparison of Incentive-based Cooperation Strategies for Hybrid Networks, 3rd International Conference on Wired/Wireless Internet Communications (WWIC 2005), Xanthi, Greece, May 11–13, 2005, ISBN: 3-540-25899-X, pp. 169–180
- Torsten Braun and Georg Carle, Editors: Proceedings of the 3rd international conference on Wired/Wireless Internet Communications (WWIC 2005), Xanthi, Greece, May 11–13, 2005, ISBN: 3-540-25899-X
- Torsten Braun, Thiemo Voigt, and Adam Dunkels: Energy-Efficient TCP Operation in Wireless Sensor Networks, Praxis der Informationsverarbeitung und Kommunikation (PIK), special issue on Wireless Sensor Networks, No. 2, 2005, ISSN 0930-5157, pp. 93–100

- Torsten Braun, Vijay Arya and Thierry Turletti: A Backup Tree Algorithm for Multicast Overlay Networks, Networking 2005, Waterloo Ontario Canada, May 2–6, 2005, ISBN 3-540-25809-4, pp. 1430–1434
- Matthias Scheidegger, Florian Baumgartner and Torsten Braun: Simulating Large-scale Networks with Analytical Models, International Journal of Simulation Systems, Science & Technology (IJS³T), Special Issue on: Advances In Analytical And Stochastic Modelling, Vol. 6, Nr. 1–2, January 2005, ISSN 1473-804x online, 1473-8031 print, pp. 24–31
- Ruy de Oliveira and Torsten Braun: A Dynamic Adaptive Acknowledgment Strategy for TCP over Multihop Wireless Networks, IEEE Infocom 2005, Miami, USA, March 13–17, 2005, ISBN 0-7803-8969-7 (CD-ROM)
- Marc Danzeisen, Torsten Braun, Simon Winiker and Daniel Rodellar: Implementation of a Cellular Framework for Spontaneous Network Establishment, IEEE Wireless Communications and Networking Conference (WCNC), New Orleans, USA, March 13–17, 2005, ISBN 0-7803-8966-2 (softbound), ISBN 0-7803-8967-0 (CD-ROM)
- Matthias Scheidegger, Florian Baumgartner and Torsten Braun: An Integrated Simulator for Inter-Domain Scenarios, Kommunikation in Verteilten Systemen 2005 (KiVS), Kaiserslautern, Germany, February 28 – March 3, 2005, ISSN 1431-472-X, pp. 295–306
- Marcin Michalak and Torsten Braun: Common Gateway Architecture for Mobile Ad-hoc Networks, Wireless On demand Network Systems and Services (WONSS), St. Moritz, Switzerland, January 19–21, 2005, ISBN 0-7695-2292-0, pp. 70–75
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