Seungjoon Lee

Contact Information

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Research Interests

Computer Networks
- Wireless Networks, Mobile Computing, Peer-to-peer Systems, Multicast

Distributed Systems and Algorithms

Education

Ph.D., Computer Science 2006
University of Maryland, College Park, MD
Thesis: The WISE Abstraction Framework for Wireless Networks
Advisor: Professor Bobby Bhattacharjee

M.S., Computer Science 2000
Seoul National University, Seoul, Korea
Thesis: Multicasting in Wireless Ad-hoc Networks
Advisor: Professor Chong-kwon Kim

B.S., Computer Science 1996
Seoul National University, Seoul, Korea

Research Experience

The WISE Abstraction Framework for Wireless Networks
My thesis work defines a general framework to simplify the system design and achieve high performance in wireless networks. In this framework, I have proposed a set of protocols that enable efficient wireless services in various networking scenarios, including virtual backbone construction, efficient geographic routing, and a new WLAN (Wireless Local Area Network) architecture. This work also includes a logical abstraction framework that simplifies and unifies the access to link-level attributes in protocol implementations. I have evaluated the proposed solutions using simulations and real-world experiments, and the results show that the new schemes can achieve significant performance improvements over well-known existing schemes. This work involved theoretical analysis, extensive simulations, and experiments on various settings to understand the actual system performance.

PRM: Probabilistic Resilient Multicast
More frequent end node failure or ungraceful leave in application-layer multicast can disrupt successful packet delivery to other nodes and lead to significant performance degradation. PRM is a general loss recovery mechanism based on probabilistic random forwarding that any application-layer multicast scheme can use. My colleagues and I have performed detailed analysis and experiments to show that PRM can achieve near-perfect data delivery with small delay and control overheads. We have also incorporated PRM into the Darwin Streaming Server for experimentation in the context of multimedia streaming. I have played a major role in the protocol design, implementation, and experimentation of PRM.

Identification of Cooperative Peer Groups
This work proposes an efficient scheme to store user reputation information and infer trustworthiness in order to identify malicious users in decentralized peer-to-peer systems. I have actively collaborated in the design and evaluation of the proposed scheme.

Multicasting in Mobile Wireless Networks
I have designed a new multicast protocol for mobile multihop wireless networks. This scheme uses spatial locality in mobile nodes, and I have performed detailed simulation experiments to demonstrate the reduced control overheads and improved delivery performance over existing schemes.

Research Internship

Routing and Scheduling in Multihop Wireless Backhaul Networks
Bell Labs, Lucent Technologies, Murray Hill, NJ (June–August 2005)
Mentors: Girija Narlikar, Gordon Wilfong, Lisa Zhang
In this work, I (with my colleagues) designed admission control schemes based on user traffic requirements (e.g., bandwidth, latency) in multihop wireless mesh networks. We considered two cases: a scenario where only a subset of admitted nodes are guaranteed individual user requirements, and another scenario where we admit all the connections while minimizing the performance degradation. We performed analysis and simulations to understand the behavior of both schemes.

Selected Journal Publications

1. Resilient Multicast using Overlays
   Suman Banerjee, Seungjoon Lee, Bobby Bhattacharjee, Aravind Srinivasan
   IEEE/ACM Transactions on Networking, Vol. 14, No. 2, pp. 237–248, April 2006

2. Cooperative Peer Groups in NICE
   Rob Sherwood, Seungjoon Lee, Bobby Bhattacharjee
   Computer Networks, Vol. 50, Issue 4, Elsevier Science, March 2006

3. Distribution of Path Durations in Mobile Ad-hoc Networks–Palm's Theorem to the Rescue
   Y. Han, R. J. La, A. M. Makowski, Seungjoon Lee
   To appear in *Computer Networks*

4. A New Wireless Ad-hoc Multicast Routing Protocol
   Seungjoon Lee, Chong-kwon Kim
   Computer Networks, Vol. 38, No. 2, Elsevier Science, February 2002

Under Submission

5. Efficient and Resilient Backbones for Multihop Wireless Networks
   Seungjoon Lee, Bobby Bhattacharjee, Aravind Srinivasan, Samir Khuller
   Manuscript available upon request, July 2005

Selected Conference Publications

1. Distributed Channel Assignment for Multi-radio Wireless Networks
   Minho Shin, Seungjoon Lee, Yoo-ah Kim
   IEEE MASS 2006, Vancouver, Canada, October 2006

2. Admission Control for Multihop Wireless Backhaul Networks with QoS Support
   Seungjoon Lee, Girija Narlikar, Martin Pál, Gordon Wilfong, Lisa Zhang
   IEEE WCNC 2006, Las Vegas, Nevada, April 2006

3. Efficient Geographic Routing in Multihop Wireless Networks
   Seungjoon Lee, Bobby Bhattacharjee, Suman Banerjee
   ACM MobiHoc 2005, Urbana-Champaign, Illinois, May 2005

4. Scalable Resilient Media Streaming
   Suman Banerjee, Seungjoon Lee, R. Braud, Bobby Bhattacharjee, Aravind Srinivasan
   ACM NOSSDAV 2004, Cork, Ireland, June 2004

5. The Case for a Multihop Wireless Local Area Network
   Seungjoon Lee, Suman Banerjee, Bobby Bhattacharjee
   IEEE Infocom 2004, Hong Kong, China, March 2004

6. Resilient Multicast using Overlays
   Suman Banerjee, Seungjoon Lee, Bobby Bhattacharjee, Aravind Srinivasan
   ACM Sigmetrics 2003, San Diego, CA, June 2003

7. Cooperative Peer Groups in NICE
   Seungjoon Lee, Rob Sherwood, Bobby Bhattacharjee
   IEEE Infocom 2003, San Francisco, CA, April 2003

8. Robust Routing in Wireless Ad-hoc Networks
   Seungjoon Lee, Minho Shin, Bohyung Han
   ICPP Workshop on Ad Hoc Networking, Vancouver, Canada, August 2002

9. Neighbor Supporting Ad-hoc Multicast Routing Protocol
   Seungjoon Lee, Chong-kwon Kim
   ACM MobiHoc 2000, Boston, MA, August 2000

10. New User Tracking Algorithms for a Wireless Network and Performance Analysis
    Hyojun Lim, Seungjoon Lee, Chong-kwon Kim
    13th International Conference on Information Networking, Cheju, Korea, January 1999

Other Technical Reports

1. Efficient and Resilient Backbones for Multihop Wireless Networks
   Seungjoon Lee, Bobby Bhattacharjee, Aravind Srinivasan, Samir Khuller
   CS-TR 4726, University of Maryland, College Park, May 2005

2. The WISE Abstraction Framework for Wireless Networks
   Seungjoon Lee
   Ph.D. Proposal submitted to Graduate School
   University of Maryland, College Park, November 2004

3. Efficient Geographic Routing in Multihop Wireless Networks
   Seungjoon Lee, Bobby Bhattacharjee, Suman Banerjee
   CS-TR 4625, University of Maryland, College Park, November 2004

4. The Case for a Multihop Wireless Local Area Network
   Seungjoon Lee, Suman Banerjee, Bobby Bhattacharjee
   CS-TR 4504, University of Maryland, College Park, July 2003

5. Scalable Resilient Media Streaming
   Suman Banerjee, Seungjoon Lee, R. Braud, Bobby Bhattacharjee, Aravind Srinivasan
   CS-TR 4482, University of Maryland, College Park, May 2003

Teaching Experience

Teaching Assistant 2000–2002
Department of Computer Science, University of Maryland, College Park
- Computer Networks, Discrete Structures

Teaching Assistant 1996
Department of Computer Science, Seoul National University
- Computer Networks, Introduction to Algorithms, Introduction to Computer Science

Honors and Awards

Dean's Fellowship Award 2005–2006
College of Computer, Mathematical and Physical Sciences
University of Maryland, College Park

Merit-based Fellowship 2000–2002
Department of Computer Science, University of Maryland, College Park

Merit-based Fellowship 1992–1996
Seoul National University

Patent

Method And Apparatus For Scheduling Data Packet Transmission Over A Multihop Wireless Backhaul Network (US Patent Pending)
Seungjoon Lee, Girija Narlikar, Gordon Wilfong, Lisa Zhang

Professional Activities

Reviewer: IEEE Infocom, IEEE ICC, ACM MobiHoc, IEEE SECON, IEEE ICDCS, IEEE Journal on Selected Areas in Communications, IEEE Transactions on Mobile Computing, IEEE/ACM Transactions on Networking, IEEE Transactions on Wireless Communications

Citizenship and Status

Korean (Republic of Korea)
F-1 Student Visa

References

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