

KYOUNGWON SUH

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OBJECTIVE

A challenging Ph.D. level position at an industrial research laboratory or software development group in the area of computer networks and distributed systems.

SUMMARY OF QUALIFICATION

Ability to identify fundamental research issues, to formulate research problems, and to then solve these problems through a combination of design, theoretical analysis and experimental evaluation. I have developed novel network monitoring, measurement and inference methodologies, which involved the implementation of software packages to detect Skype-relayed traffic, unauthorized wireless access points, and traffic activities of end-hosts using passive and active measurements. Also, I designed and analyzed Video-on-Demand systems using peer-to-peer technologies. These experiences have provided me with significant insights in various aspects of system development.

Demonstrated ability to conduct independent research, as well as collaborate with researchers across universities and industrial laboratories, and manage project teams of size 3 to 5.

10+ years of system development experience and 7 years of operating system kernel implementation and retargeting experience on shared memory multiprocessor systems and mobile handset devices.

RESEARCH PROFICIENCIES

- Network measurement and inference
- Overlay networks, Peer-to-Peer systems, and Content Distribution Networks
- Multimedia streaming
- Network modeling and performance evaluation
- Operating system kernel (with emphases on design, implementation, and retargeting for large-scale systems and small-scale embedded systems)

SKILLS

- Languages: C/C++, Java, Perl, assembly languages, Pascal, Fortran, MPI, SQL, Csh, Awk
- Operating Systems: Unix, Linux, FreeBSD, Windows, Nucleus
- Tools: Matlab, CPLEX, Network Simulator; Tcpdump, Ethereal, Sed, Kdb, Dbx
- Protocols: TCP/IP, LDAP, Routing protocols
- Endace DAG cards

EDUCATION

- **PhD in Computer Science** *May, 2007 (Expected)*
UNIVERSITY OF MASSACHUSETTS, AMHERST Amherst, MA
- **Master of Science (M.S.) in Computer Science** *October, 2000*
RUTGERS UNIVERSITY Piscataway, NJ
- **Master of Science (M.S.) in Computer Engineering** *February, 1993*

- **Bachelor of Science (B.S.) in Computer Engineering**
SEOUL NATIONAL UNIVERSITY

February, 1991
Seoul, Korea

RESEARCH EXPERIENCE

- **Research Assistant** *August'01 onwards*
Computer Networks Research Group
DEPARTMENT OF COMPUTER SCIENCE UMass Amherst

Characterizing and Detecting Skype-relayed Traffic: We develop a novel method to characterize the nature of Skype relay traffic and to detect its presence in the network using the measurements collected passively at the edge of a large network. Our technique relies solely on flow-level traffic characterization instead of application-level or protocol-specific information. We propose several metrics to capture the nature of relay traffic, and we are able to detect Skype relay traffic traversing across the access point of a large network using these metrics. In addition, we find that the proposed metrics can be applied more broadly in detecting relay traffic generated by other multimedia applications. **The implementation of the monitoring and inference tool is on a Linux box equipped with an Endace DAG card.**

Locating Network Monitors and Controlling their Sampling: We study the large network-monitoring problem. The objective is to monitor a large fraction of IP flows in a cost-effective manner by carefully placing monitors and controlling their sampling rates. To address the tradeoff between monitoring cost and monitoring coverage, we consider minimum cost and maximum coverage problems under various budget constraints. We show that all of the defined problems are NP-hard. We propose greedy heuristics, and show that the heuristics offer solutions close to the optimal through experiments using synthetic and real network topologies. In addition, our experiments show that a small number of monitors is often enough to monitor most of the traffic in an entire IP network.

Exploiting the IPID Field to Infer Network Path and End-system Characteristics: In this work, we develop several new techniques which use the IPID field to infer (a) the amount of internal (local) traffic generated by a server; (b) the number of servers in a large-scale, load-balanced server complex; and (c) the difference between one-way delays of two machines to a target computer. We validate the use of these techniques through empirical measurement studies. **The implementation of the passive and active monitoring tool is on Linux.**

Passive Online Rogue Access Point Detection: In this work, we propose online algorithms to detect rogue access points (unauthorized wireless access points) using sequential hypothesis tests applied to passively-measured packet header data collected at a gateway. The online algorithms utilize a TCP ACK-pair technique that we develop to passively differentiate wired and wireless LAN TCP traffic. Depending on whether training sets are available, we propose two sequential hypothesis tests: one with training and the other without training. Extensive experimental validations in various scenarios and over hosts with various operating systems demonstrate the excellent performance of our approach. **The implementation of the online monitoring and inference tool is on a Linux box equipped with an Endace DAG card.**

Pull-based Peer-to-Peer Video-on-Demand services: In this work, we propose the P2Cast and Directstream architectures that use peer-to-peer approaches to cooperatively stream video using patching techniques, while only relying on unicast connections among peers. We address the following two key technical issues in P2Cast and Directstream: (1) constructing an application overlay appropriate for streaming; and (2) providing continuous stream playback (without glitches) in the face of disruption from an early departing client.

- **Research Intern** *March'06-July'06*
Thomson Paris Research Lab Paris, France

Push-to-Peer Video on Demand system: We propose the Push-to-Peer architecture, a peer-to-peer approach to cooperatively stream video. The main departure from previous work is that content is proactively pushed to peers, and persistently stored before the peer-to-peer transfers begin. The initial content placement increases content availability and improves use of peer uplink bandwidth. Our specific contributions are: (i) content placement and associated pull policies that allow optimal use of uplink bandwidth and perfect balancing of download rates among competing downloads; (ii) performance analysis of such policies in the case of controlled environments such as DSL networks under ISP control; (iii) distributed load balancing strategies for initial selection of serving peers; (iv) distributed strategies to cope with dynamic uplink bandwidth.

- **Research Assistant** *September'99-June'01*
Networks Research Group
DEPARTMENT OF COMPUTER SCIENCE Rutgers, Piscataway

Practical Network and system support for defending TCP SYN flooding attacks: We propose an approach to defending Internet services against TCP SYN Denial-of-Service (DoS) attacks. Our approach is based on the deployment of a network of responding hosts at the connection points between edge networks and the core of the Internet. Each responding host protects some range of IP addresses and generates RST packets when it detects that an unreachable IP address it is protecting is being used as the spoofed source address of a TCP connection. These RST packets allow the victim of a SYN DoS attack to quickly drop spoofed connection requests.

WORK EXPERIENCE

- **Research Intern** *June'00-August'00*
Applied Research Laboratory Telcordia Technologies, Morristown
Developed an application-level network monitoring mechanism and investigated traffic engineering approaches in MPLS-enabled networks.
- **Research Intern** *June'99-August'99*
Applied Research Laboratory Telcordia Technologies, Morristown
Developed Service Management System (SMS) for Next Generation Network (NGN). Responsibilities included design and implementation of SMS using LDAP interface.
- **Senior Research Engineer** *October'96-August'98*
Media & Communication Laboratory LG Electronics, Korea
Developed system software for LG smart-phones. Responsibilities included design and implementation of an embedded-kernel and SDK (software development toolkit).
- **Research Engineer** *February'93-October'96*
Media & Communication Laboratory LG Electronics, Korea
Developed a multiprocessor operating system for the SMP system with 10 Pentium processors in TICOM III Project (Jointly funded by Korean Government and industries). Responsibilities included restructuring and retargeting Unixware 2.x Kernel to a newly developed LG multiprocessor system and integrating all system software components. **LG TICOM III systems have been used as main servers of the National Administrative Information Network in Korea.**

TEACHING EXPERIENCE

- **Teaching Assistant** *September'98-July'00*
Department of Computer Science Rutgers University, Piscataway
Teaching Assistant for undergraduate courses on Computer Architecture (CS211), Internet Technology (CS351), and Introduction to Computers and Applications (CS110). Responsibilities included teaching recitation sessions, grading, and holding office hours.

- **Primary Instructor** *June'91-July'91*
Education and Research Computing Center Seoul National University, Korea
 Taught an undergraduate course on C programming language. Responsibilities included delivering all lectures, labs, holding office hours, and designing assignments.

PROFESSIONAL ACTIVITIES

- Reviewer for several network conferences and journals, including *IEEE Transaction on Networking*, *IEEE JSAC*, *Elsevier Computer Networks*, *IFIP Networking*, *ACM CoNext*, *NSDI*, *IEEE CCNC*.
- Student member of ACM, IEEE, and IEEE communication society.

AWARDS/HONORS

- ACM SIGCOMM student travel grant, 2001.
- Telcordia Technologies (formerly Bellcore) Inc. research fellowship, 9/1999-6/2001.
- LG Electronics Inc. industry academic liaison scholarship, Korea, 1991-1993.
- Excellent undergraduate student scholarship, Seoul National University, Korea, 1989-1991.
- Honorable mention in the annual student thesis contest sponsored by Korea Information Science Society, Korea, 1991.

PUBLICATIONS

Journal Papers

1. Yang Guo, **Kyoungwon Suh**, Jim Kurose, Don Towsley, "[P2Cast: peer-to-peer patching for video on demand service](#)", *Multimedia tools and applications*, Kluwer, November, 2006.
2. **Kyoungwon Suh**, Yang Guo, Jim Kurose, Don Towsley, "[Locating network monitors: complexity, heuristics, and coverage](#)", *Computer communications*, Elsevier, August, 2005.
3. Joongheon Kim, Wonjun Lee, Eunkyo Kim, Dongshin Kim, **Kyoungwon Suh**, "Optimized transmission power control of interrogators for collision arbitration in UHF RFID systems", accepted for publication in *IEEE Communications Letters*, 2007.
4. Yang Guo, **Kyoungwon Suh**, Jim Kurose, Don Towsley, "DirectStream: A directory-based peer-to-peer video streaming service", *submitted for publication*, 2006.

Conference and Workshop Papers

5. **Kyoungwon Suh**, Christophe Diot, Jim Kurose, Laurent Massoulie, Christoph Neumann, Don Towsley, Matteo Varvello, "Push-to-Peer Video-on-Demand system: design and evaluation", submitted to *ACM SIGMETRICS 2007*.
6. Wei Wei, **Kyoungwon Suh**, Yu Gu, Bing Wang, Jim Kurose, "Passive online rogue access point detection using sequential hypothesis testing with TCP ACK-pairs", submitted to *ACM SIGMETRICS 2007*.
7. **Kyoungwon Suh**, Daniel R. Figueiredo, Jim Kurose, Don Towsley, "[Characterizing and detecting skype-relayed traffic](#)", in *Proceedings of IEEE Infocom*, Barcelona, Spain, April, 2006 (*acceptance ratio: 18%*).
8. **Kyoungwon Suh**, Yang Guo, Jim Kurose, Don Towsley, "[Locating network monitors: complexity, heuristics, and coverage](#) ", in *Proceedings of IEEE Infocom*, Miami, Florida, March, 2005 (*acceptance ratio: 17.2%*).
9. Weifeng Chen, Yong Huang, Bruno Ribeiro, **Kyoungwon Suh**, Honggang Zhang, Edmundo de Souza e Silva, Jim Kurose, Don Towsley (*in alphabetical order*), "[Exploiting the IPID field to infer network path and end-system characteristics](#)", in *Proceedings of Passive and Active Measurement Workshop*, Boston, Massachusetts, March, 2005 (*acceptance ratio: 28%*).
10. Yang Guo, **Kyoungwon Suh**, Jim Kurose, Don Towsley, "[A peer-to-peer on-demand streaming service and its performance evaluation](#)", in *Proceedings of IEEE International Conference on Multimedia & Expo*, Baltimore, Maryland, July, 2003 (*acceptance ratio: 57.9%*).

11. Yang Guo, **Kyoungwon Suh**, Jim Kurose, Don Towsley, "[P2Cast: peer-to-peer patching scheme for VoD service](#)", in *Proceedings of World Wide Web Conference*, Budapest, Hungary, May, 2003 (acceptance ratio: 12.8%).

Technical Reports

12. **Kyoungwon Suh**, "A study on the use of deterministic and non-deterministic AI techniques for fault localization problem in IP networks", Synthesis Project Report, University of Massachusetts at Amherst, 2004.
13. **Kyoungwon Suh**, Thu D. Nguyen, "[A practical defense against SYN Denial-of-Service attacks](#)", DCS-TR-452, Rutgers University, 2001.
14. **Kyoungwon Suh**, Brett J. Vickers, "[A survey of application management for network management and traffic engineering](#)", DCS-TR-425, Rutgers University, 2000.

SOFTWARE

- TCP flow analysis and inference tool for detecting rogue wireless access points, 2006.
- Flow analysis and inference tool for detecting Skype-relayed traffic, 2005.
- Distributed online bulletin board system (BBS), multi-user chat service, and weather report service provided by KETEL, one of the most popular online BBS services in late 80's in Korea (later changed to HiTEL), 1989.

REFERENCES

Prof. Jim Kurose

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