

Avesh Kumar Agarwal

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- Education** **Ph.D. Student** **August 2003 – Present**
Department of Computer Science
North Carolina State University, Raleigh, NC
GPA: 4.0/4.0
- Bachelor of Engineering in Computer Science & Engineering** **July 1996 – May 2000**
Motilal Nehru Regional Engineering College (now MNNIT), India
GPA: 75.2% (Honors)
- Research Statement** **Protection and Performance Management in Wireless Networks**
1. Design of dynamic security policy management schemes for optimizing performance in wireless networks
2. Statistical modeling of performance metrics with respect to network factors to analyze performance of a wireless ad hoc network running different routing protocols
- Research Experience** **NEC Research Lab, USA** **June 2006 – August 2006**
Full Time Summer Research Assistant with Dr. Dragos Niculescu, Broadband and Mobile Networks Group
- **QoS for Voice over IP (VoIP) in Wireless Mesh Networks (WiMesh)**
Description: One of the problems in wireless mesh (multi-hop) networks is the lack of quality of service (QoS) required for voice (VoIP). The WiMesh project focuses on designing and optimizing reliable and application-aware multi-hop networking mechanisms for flexible and cost-efficient support of QoS-sensitive services. Specifically, I focused on finding root causes that lead to degraded VoIP performance in wireless mesh networks. [Work under NDA]
- North Carolina State University** **August 2003 – Present**
Research Assistant with Prof. Wenye Wang
- **Design of Feedback based Dynamic Security Policy Management (DSPM) in Wireless Networks**
Description: The inefficiencies of static-configuration paradigm for security management in wireless networks are the motivation behind this work. Static configuration of security policies do not adapt to changing network conditions, such as variations in wireless link characteristics, leading to degradation in network performance. The rationales for advocating dynamic security paradigm are manifolds. First, security overhead may affect network performance as throughput and delay because of its relationship with radio link conditions. Second, as the attack patterns change, static security may not be appropriate for providing desired security protection. We have analyzed DSPM using semi-Markov decision process.
 - Currently using Openswan (IPSec) and Open1x (802.1x) open source codes to implement DSPM modules using language C on Linux platform in wireless testbed.
 - Implemented DSPM toolkit using MATLAB to obtain simulation results.
 - **Statistical Modeling of Performance Metrics under the Impact of Routing Protocols in Wireless Ad Hoc Networks**
Description: The main goal was a statistical study on the performance of routing protocols based on measurements on an indoor ad-hoc network testbed. Specifically, we studied how routing overhead, packet size and hop-count interact with each other, and to what extent they affect end-to-end delay and throughput. We also introduced two new metrics, "data transmission time" and "overhead time" for understanding the impacts of routing protocols on our measurements. To study proactive and reactive protocols collectively, we investigated the most widely used routing protocols Optimized Link State Routing (OLSR) and Ad-hoc On-demand Distance Vector (AODV) routing protocol as case studies. The outcome of our study is two-fold: (i) new findings of experimental measurements that demonstrate the impact of routing protocols and parameters on network performance; and (ii) statistical models of throughput and delays using Matlab.
 - Setup a wireless ad hoc testbed, and configured AODV and OLSR open source.
 - Used various tools such as iperf, tcp, iptables etc to gather measurements.
 - **Performance Analysis of Wireless Security Protocols in Wireless Mobile Networks**
Description: In this project, the aim was to study the cross-layer integration of security protocols to gain a deeper understanding about the trade-offs between performance overhead and security benefits in wireless LANs with IP mobility, in a variety of network environments. In order to achieve these goals, we setup a real-

time experimental testbed, which is a miniature of existing wireless networks to ensure that the experimental scenarios are consistent with typical deployment of wireless LANs, while using mobile IP for roaming support between two wireless subnets. The findings in this project have led to the design of a better security policy management systems for wireless networks.

- Setup a wireless mobile testbed consisting of two subnets using Mobile IP open source.
- Configured security policies using WEP, and Freeswan (IPSec), Open1x (802.1x) open sources.
- Used various tools such as iperf, ttcp, iptables etc to gather measurements.
- Wrote shell scripts to automate the experiments.

Full-time Work Experience Lucent Technologies

Dec 2001 – July 2003

Software Engineer, Multi Service Switching

Description: Feature enhancement and bug fixing for ATM/Frame relay network core switches.

- Implemented and tested a feature for “network crash analysis”. The goal of the feature was to determine the root causes and solution for crashes, which occur frequently. The feature identified various failure points in the system at run time and logged the crash information for analysis later.
- Fixed bugs in various system modules such as diagnostic and messaging.
- Used C and C++ languages on pSoS platform.
- Used “Codetaps” hardware for debugging various modules.

Future Software Limited

July 2000 – Dec 2001

Software Engineer, R&D- Data Communication Products Division

Description: Design of DVB-RCST Router (Digital Video Broadcasting - Return Channel Satellite Terminal). DVB-RCST router is a part of two-way satellite communication network, provides wireless broadband access (WBA) to the hosts connected to it, and implements DVB-RCS standard. TCP/IP data is encapsulated inside MPEG stream and then transmitted over the network.

- Integrated virtual private network (VPN) capabilities in DVB-RCST router using PPP and L2TP protocols, and IPSec.
- Wrote unit and system tests for DHCP module of the router.
- Implemented a memory leak detector tool to identify the memory allocation and free instances at the run time for the router.
- Used language “C” on pSoS platform.

Teaching Experience

Graph Theory (Graduate Level CSC/MA/OR 565)

Fall 2006

I gave some lectures, held office hours, and graded home works and exams.

Mobile Communication (Advanced Graduate Level ECE/CSC 791o)

Fall 2004

I instructed students during lab sessions, graded lab exercises, and assisted students for course projects.

Wireless Networking (Graduate Level ECE/CSC 591v)

Spring 2004

I designed wireless lab exercises, instructed students during lab sessions, and graded lab exercises. Besides, I designed course projects and assisted students in those projects.

Publications

Book Chapters (Submitted) [1] "**An Experimental Study on Security Protocols in WLANs**," Avesh K. Agarwal and Wenye Wang, submitted to Y. Xiao, X. Shen, and D.-X. Du, Resource, Mobility and Security Management in Wireless/Mobile Network Security, to be published by **Springer**, 2006.

[2] "**The Effects of Authentication Mechanisms on Quality of Service in Mobile Wireless Networks**," Wenye Wang, Wei Liang, and Avesh K. Agarwal, submitted to Y. Zhang, H. Hu, and M. Fujise, Resource, Mobility and Security Management in Wireless Networks and Mobile Communications, to be published by **Auerbach Publications, CRC Press**, 2006.

Journal

[1] "**On the Impact of Quality of Protection in Wireless Local Area Networks with IP Mobility**", Avesh K. Agarwal, Wenye Wang
To appear **ACM-Springer Mobile Networks and Applications (MONET) Journal**, August, 2006

[2] "**Integration of Authentication and Mobility Management in Third Generation and WLAN Data Networks**", Wenye Wang, Wei Liang, and Avesh K. Agarwal
To appear in [Journal of Wireless Communications and Mobile Computing \(WCMC\)](#) – special issue on "WLAN/3G Integration for Next-Generation Heterogeneous Mobile Data Networks," December 2004.

[3] "**An evaluation of current QoS solutions for mobile IP networks**"
Avesh Agarwal, R. Krishna Kumar
Volume 8, Issue 2, Lucent's **Bell-Labs Technical Journal (BLTJ)**, Sep 2003.

- Conference
- [1] **“LAP: Link-Aware Protection for Improving Performance of Loss and Delay Sensitive Applications in Wireless LANs”**, Avesh Agarwal, Wenye Wang, Rachana Gupta, Mo-Yuen Chow
To appear in **IEEE Milcom 2007**, Orlando, Florida, USA, October, 2007.
 - [2] **“Performance Assessment of Data and Time-Sensitive Wireless Distributed Networked-control-Systems in Presence of Information Security”**, Rachana Gupta, Mo-Yuen Chow, Avesh Agarwal, Wenye Wang, to appear in **IEEE Milcom 2007**, Orlando, Florida, USA, October, 2007.
 - [3] **“Information Security with Real-time Operation: Performance Assessment for Next Generation Wireless Distributed Networked-Control-Systems”**, Rachana Gupta, Avesh Agarwal, Mo-Yuen Chow, Wenye Wang, to appear in the Proc. of 33rd Annual Conference IEEE Industrial Electronics Society, 2007
 - [4] **“DSPM: Dynamic Security Policy Management for Optimizing Performance in Wireless Networks**, Avesh Agarwal, Wenye Wang, **IEEE Milcom 2006**, Washington D. C., USA, October, 2006.
 - [5] **“An Experimental Study of Cross-Layer Security Protocols in Public Access Wireless Networks”**
Avesh Agarwal, Wenye Wang, **IEEE Globecom 2005**, St. Louis, USA, November, 2005
 - [6] **“Measuring Performance Impact of Security Protocols in Wireless Local Area Networks”**
Avesh Agarwal, Wenye Wang, **IEEE Broadnet 2005**, Boston, USA, October 2005.
 - [7] **“Statistical Analysis of the Impact of Routing in MANET Based on Real-Time Measurements”**,
Avesh Agarwal, Wenye Wang, **(Nominated for Best Paper Award)**,
ICCCN 2005, San Diego, California, USA, October 2005.
 - [8] **“An Experimental Study of Wireless Security Protocols over Mobile IP Network”**
Avesh Agarwal, Jorinjit S. Gill, and Wenye Wang,
Proc. of IEEE Vehicular Technology Conference 2004 (**IEEE VTC04 Fall**), USA, September 2004.

Articles

- [1] **“Towards A Mobile Internet”**
Agarwal Avesh, Agarwal Niresh
IT Magazine, Electronics For You, September 2002.
<http://www.electronicsforu.com/efylinux/efyhome/cover/MobiP.pdf>
- [2] **“Using Satellites as a backbone for Internet”**
Agarwal Niresh, Agarwal Avesh
IT Magazine, Electronics For You, July 2002.

Skills

Operating systems: Windows, UNIX, Linux

Programming languages: C, C++

RTOS: pSoS, VxWorks

Networking protocols: TCP/IP, DHCP, ATM, Ethernet, PPP, L2TP, VPN

Tools: Ethereal, GDB, Kismet, MATLAB, iperf, tcp, iptables, “click” router module

Relevant course work

Design and Analysis of Algorithms (A+), Computer Networks (A+), Computer Performance Modeling (A+), Probability and Stochastic Processes II (A+), Graph Theory (A+), Performance Evaluation of Computer Networks (A), Information System Security (A-), Internet Protocols (A), Wireless Networking (A), Operating System Principles (A)

Honors and Awards

- Milcom 2006 Student Travel Grant.
- Member of **Phi Kappa Phi** Honor Society.
- *Merit Scholarship* throughout 4 years of undergraduate study.
- Stood Rank 21st among 100,000 candidates who appeared for the Uttar Pradesh state Combined Entrance Exam –1996, India.
- Ranked among top 25 students in Uttar Pradesh state board High school (10th Standard) exam in 1994 and was ranked 2nd in Agra city, India.

References

Available on request.